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# MOTOR AGE

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Number 9

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# MOTOR AGE

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## MOTOR AGE

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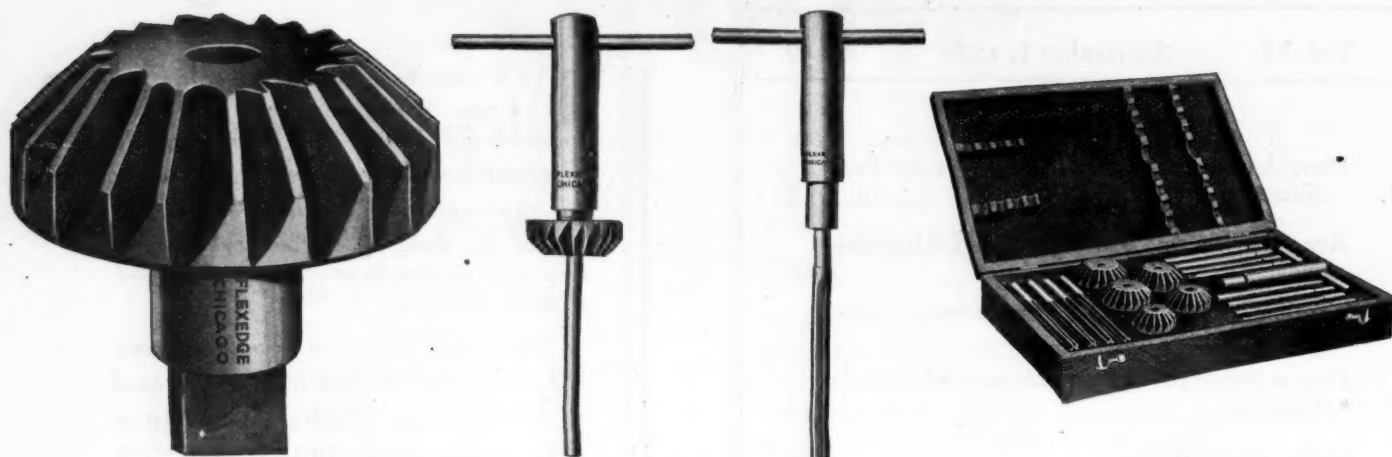
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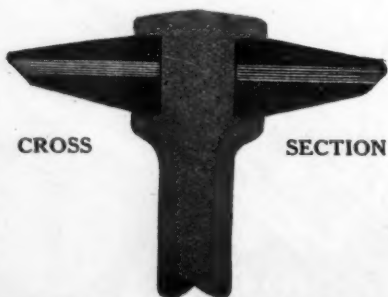
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CROSS

SECTION

We are now in active production on these tools which were designed particularly to overcome the various faults of valve tools.

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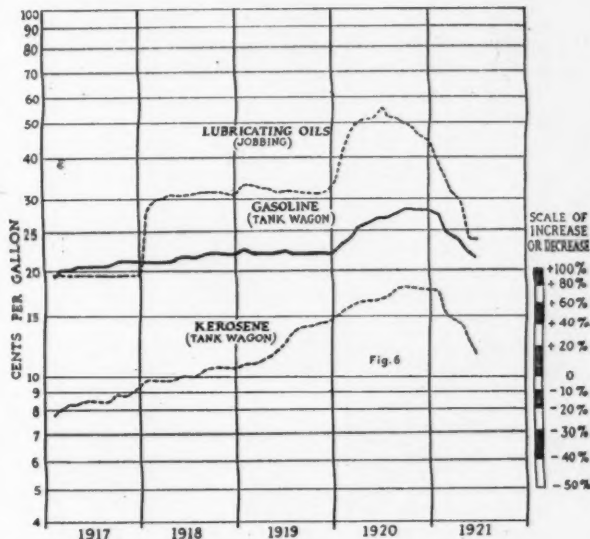
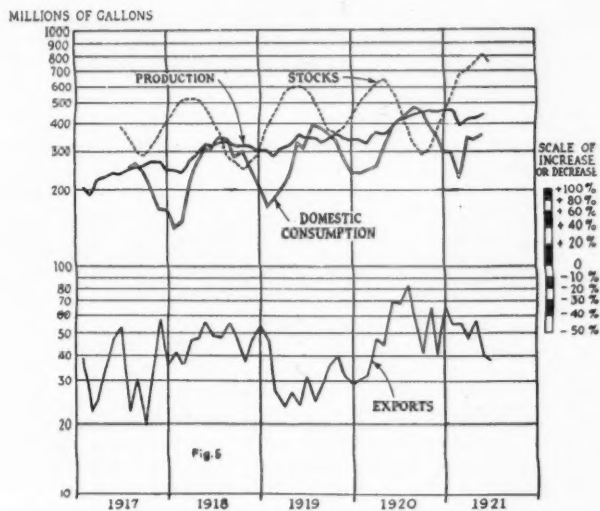
340 W. Huron St., Chicago



# MOTOR AGE

## How the Service Station Can Help the Fuel Situation

*Only Seventy-five Per Cent of Fuel Entering Cylinders Does Useful Work—Old Engines Must Be Brought Up to Date—Lubrication of Chassis Important*



On the left is a chart showing the trend of the gasoline situation by years from 1917 to 1921. The other chart shows the trend of the average prices of gasoline, kerosene and lubricating oils by months over the same period. These charts are by Dr. Joseph E. Pogue

**E**ACH automotive service station and repairshop will in the next few years probably be called upon to do its share towards a national conservation of motor fuel.

It is quite true gasoline today is selling for about the same amount as before the war, a situation likely to induce carelessness, not only on the part of the car owner or driver, but of the service station employee, who for the sake of giving a customer an apparently good-running engine, will set the carbureter mixture too rich.

There are no figures to show the status of the fuel mixtures used in passenger cars, trucks or tractors, but it is safe to say that the majority of automotive vehicles operating today are doing so on too much fuel. One of the most common contributing factors to this is the over-rich mixture. There are, of course, many

### Majority of Automotive Vehicles Operating on Too Rich Mixture

other things connected with the running of automotive vehicles which have a bearing on the amount of fuel used and these will be taken up a little later.

### DOMESTIC CONSUMPTION GREATER THAN PRODUCTION

Many will say, "Why worry about gasoline? It's cheap and there's plenty of it to go around for years to come." Partly true. By studying one of the accompanying charts it will be noted that there has been a steady increase in the production of gasoline over the period extending from 1917 to 1921. The annual increase is something like 18 per cent. But, without going into detail here, it might be said our geologists predict that the curve of petroleum production,

in this country at least, will soon reach a peak, if it has not already done so. This fact, coupled with the fact that daily more and more automotive vehicles are being put into use, should be ample reason why those connected in any way with an industry dependent on petroleum should be concerned, if not worried.

Fuel experts have assured us we shall have motor fuel of some kind for a time at least, but it is quite likely that this fuel will cost considerably more money than the present-day fuel. What probably will happen is that processes will be evolved by which the efficiency of petroleum will be increased. This is something that must be jointly attacked by the refiners, the designers and builders of apparatus using such fuels, the distributors and dealers selling the apparatus, the service station operators who must properly maintain automotive vehicles and lastly but equally as im-

portant as the others, the owners of vehicles.

The domestic consumption of petroleum in this country has for several years been much greater than our domestic production. According to figures presented by the U. S. Geological Survey, there is an estimated total original supply of crude petroleum in this country of 11.4 billion barrels. Up to January, 1921, 48 per cent of this had been consumed, leaving an estimated 52 per cent unmined supply. The total marketed from United States production to the end of 1918 was 4.6 billion barrels. Last year, it is stated, there were consumed in this country 531 million barrels of crude oil, as against a production of 443 barrels. The difference of 88 million barrels was made up by imports from Mexico.

It has very often been said that the average automobile engine burns less than 75 per cent of the fuel that goes into the cylinders. The problem of really burning the fuel in the cylinders has not altogether been solved. This is one reason for the above statement. Another reason is that the average automobile engine runs throttled nearly all of the time.

The question of fuel economy is of vast importance to the dealer, the garagemen and the service station operators, because it is through them largely that the ten million or more vehicles now in operation can be reached.

The newer engines are vastly superior to those engines of a few years ago in the matter of handling modern fuel. The engines in the old cars waste fuel. Unless they have been properly prepared to cope with modern fuel, one-quarter of the fuel entering the cylinders does no useful work. The fuel might as well be dumped on the ground!

In fact, it would be better were the fuel dumped on the ground. This wasted fuel results in much harm being done the engine, particularly through the dilu-

tion of the crankcase oil and the washing away of the oil film from the cylinder walls. This naturally accelerates piston and cylinder wear and, if not curbed in time, means more and more raw fuel leaking past the pistons into the oil.

#### GASOLINE MILEAGE SACRIFICED TO SPEED

Just at this time the average American driver does not worry very much about his gasoline mileage. What he wants is "getaway" and the ability to do 40 or better in second gear. Consequently many of the carburetor engineers are of the opinion that they should design and build a carburetor for performance, with economy a secondary consideration.

As long as this seems to be what the driving public wants, the men called upon to design and build automotive vehicles probably will see that it gets it. Not so very long ago a car manufacturer requested a test in his factory laboratory on a new carburetor for the sole purpose of getting better acceleration and a higher maximum speed. It was done largely because the dealers for that car had complained to the factory they could not sell the car because customers wanted more "getaway" and more speed—all of which it is possible to give them, but generally at a sacrifice of fuel. It helps to sell cars, but does not materially help the fuel problem.

Many of the car manufacturers are adding smaller models to their lines. These are powered with smaller engines, and other things being equal, these engines will be more economical in the use of fuels than the larger ones. In the old days a business man would drive to his office in a seven-passenger car. Now he uses a small car and saves the larger car for longer trips and for trips with more passengers.

Naturally, the driving public must accept what the automobile factories offer it. A car owner might have his own

theories regarding how an engine should be built or a manifold should be designed, but in the long run he must adjust his likes and dislikes to what is available. As was stated before, the newer cars are fitted with engines on which much effort has been spent to make them perform well and at the same time be as economical in the use of fuel as possible. The reason this can be done on new models is because our engineers have made wonderful strides in recent years regarding the proper carburetion of the modern relatively heavy fuel.

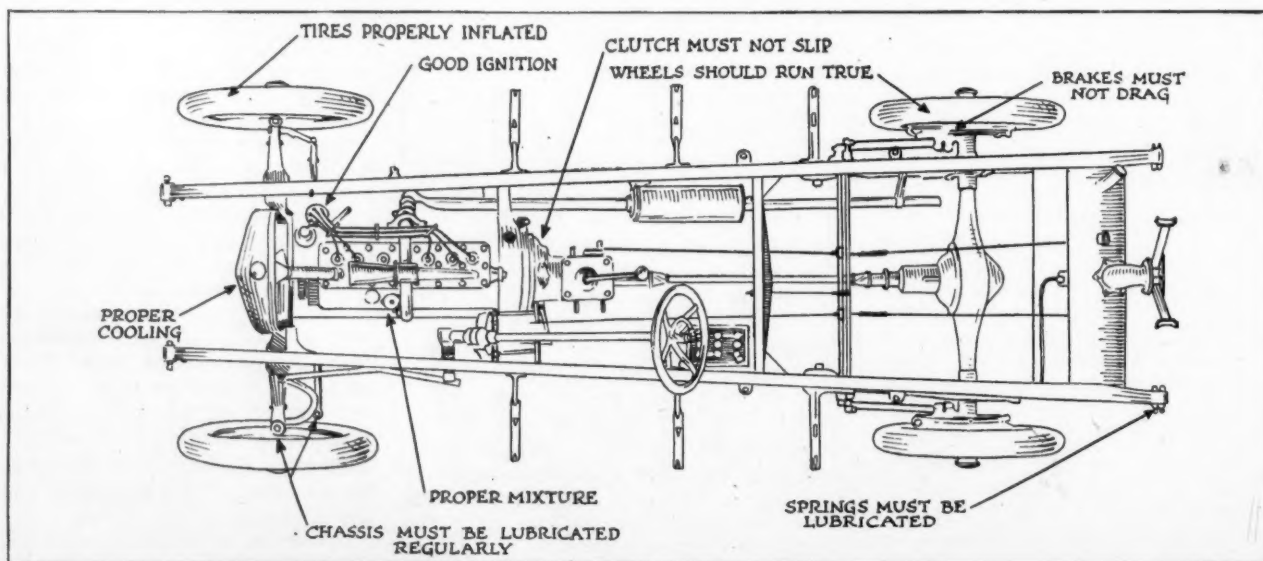
The cars built a few years ago were fitted with engines suited to the gasoline prevailing in those days; consequently such engines do not always work to best advantage with present fuel. That is the reason why many of the older cars come into the service station on a few cylinders and the mechanics often are at a loss in seeking a remedy for the trouble. It is on these older models that the most work will have to be done by the service stations and shops of the country. The present day engines will get along all right for some time to come on our present-day fuel, but the job is going to be more and more difficult for the older models.

#### NEED OF FUEL-SAVING CAMPAIGN URGENT

The efforts of only a few shops towards better economy would, of course, amount to very little, but if all the service stations, assisted by the factories, could carry on some sort of a fuel-saving campaign it would amount to an almost inconceivable saving.

The dealer who operates a service station might well carry on some sort of educational campaign with his customers whereby they would be taught the fundamentals of car operation governing the economical use of fuel. Factories might cooperate with the dealers by sending out information regarding their products as affecting fuel saving.

### Some of the Factors on Chassis Governing Economical Use of Fuel



Fuel conservation not only means the carburetor must be adjusted correctly, but takes in such things as tire inflation, chassis lubrication, ignition, cooling, etc.



## Plenty of Fuel but Economy Is Necessary

By JOSEPH E. POGUE  
Petroleum Engineer and Statistician

**S**TATEMENTS are current to the effect that the petroleum supply of the United States will be exhausted within a score of years. Such statements are misleading. Decline curves of the older oil fields indicate that this country will be producing petroleum fifty years hence, perhaps even into the next century, but in greatly diminished volume.

Irrespective of the quantity of recoverable petroleum underground, the output of this country must inevitably decline. This decline, however, may be expected to be a slow recession over a considerable number of years, rather than a sharp and sudden curtailment.

The peak of production was possibly reached in June of this year. That this record will be bettered is unlikely, although it can doubtless be surpassed if we are willing to pay the price. But whether the output of petroleum in the United States has actually or almost reached its maximum rate is immaterial. Likewise, the exact size of the unmined reserve is of secondary importance. *The point to be empha-*

*sized is the coming necessity for increasing the over-all efficiency of petroleum—a problem that concerns not only the producers and refiners of oil but the manufacturers of appliances that consume its products, as well. From now on the tendency will be to use relatively less of the material itself, but to put greater effort into increasing the service value extracted from it.*

There is no valid reason why any activity fundamentally dependent upon liquid fuel should meet with permanent restrictions in energy supply. The heat units available in liquid form are practically limitless, so far as present generations are concerned; we properly utilize only a few per cent of those contained in petroleum and almost entirely neglect the content of leaner resources such as oil-coals and oil-shales. *Readjustments in our economic practice there must be; restrictions in our economic growth there need not be. A lessened supply of crude petroleum would present an opportunity, not a handicap.*

The car and engine maker has built certain things into his product, and theoretically these products should operate the same everywhere. However, cars go to all sorts of climates, and what is good for a car in Alaska might not hold for the car in the Canal zone. Perhaps a larger hot air stove is needed for the one carbureter and maybe the other needs none at all. But the point is—certain changes are essential before the cars will operate with any degree of uniformity in both cases. These essentially are things for the maker to consider.

When we come to the service stations there is another story. It is in the service stations that the final check-up is made on the factories. Of course, with large production, slips will occur and it rests largely on the service station to find these and remedy them before the car can be turned over to the customer.

### PROPER CARBURETION IMPORTANT

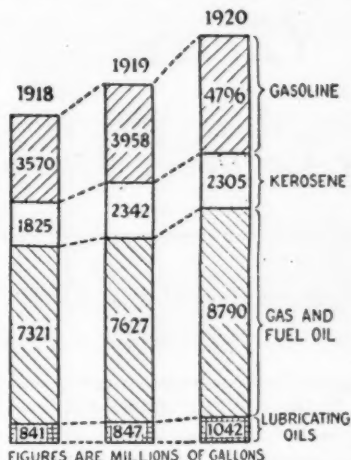
Likewise, it is the service station to which the car owner comes after he has run the car awhile. The service man, then, is one of the best points of contact between the maker's product and the consumer. He is in a strategic position and has the potential power to put over practically anything the maker of the car or the dealer desires.

The service station can be of help in the work of fuel conservation by checking up first of all on their customers' cars as regards the setting of their carbureters. It has been shown that cars are using from 20 to 30 per cent more fuel than necessary, and one way of explaining this great waste is to state these cars are running on too rich a mixture. The average car owner knows little or nothing about carburetion. And, for that matter, most mechanics are in the same class. They may know that certain adjustments have to be made, but why they are made is Greek to them.

Some of the older models can be made to give several more miles per gallon with a little intelligent work. Frequently the mere installation of a device to furnish more heat to the fuel will work

wonders. It does not even necessitate the use of a new carbureter.

Carburetion, however, is not the only thing to which our service stations must give their attention in getting fuel economy. There are many other con-



Comparative production of petroleum products in the United States over the last 3 years. If the fraction gas and fuel oil could be used as motor fuel it would more than double our potential supply

tributing factors such as ignition, valves, cooling, lubrication of the chassis, engine lubrication, tire inflation, etc.

In order that a car may be propelled as easily as possible with a minimum amount of fuel it must roll easily. To make it roll easily, there must be no tight bearings in the driving mechanism. The wheels must run true and the tires must be pumped to sufficient pressure to round them out and thereby present the minimum amount of friction to the road.

Clutches must transmit the load from the engine to the driving mechanism without slippage. The latter not only results in wasting fuel due to the increase in revolutions of the engine, but accelerates wear of the parts.

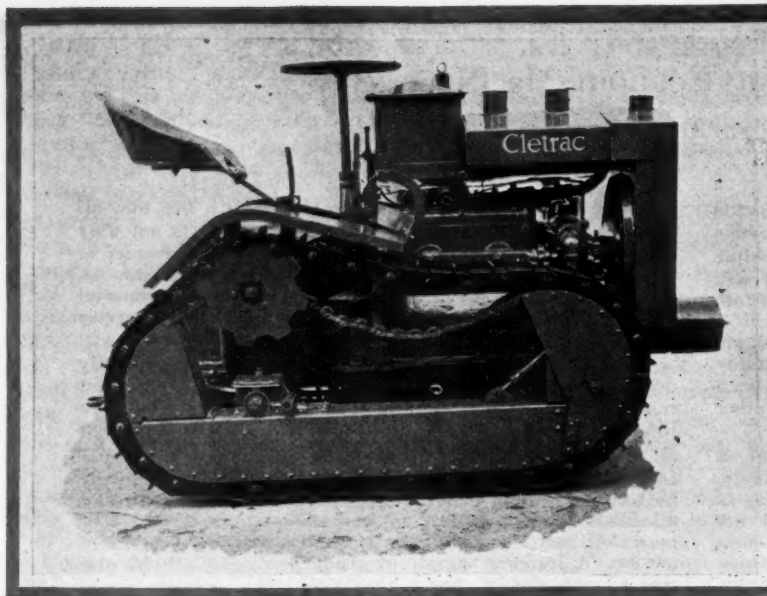
Over-cooled engines constitute another

stumbling block in the way of economy. The internal combustion engine is essentially a heat engine and it is surprising how hot it can be run without reducing the power or running into troubles from overheating. For example, the performance of one six-cylinder engine we know of was bettered when the fan belt was removed and the engine run without a fan. It stepped up the temperature to the point where the engine operated most efficiently.

It goes without saying that the valves of an engine must be in good order if a degree of economy is to be had from the fuel. Poorly seating valves or improperly timed valves will eat up fuel very fast. Especially is this true when ignition is poor. Wear of the spark and throttle control levers and bell cranks often results in the engine operating on a late spark, thus tending to use up more fuel than necessary. These conditions hold principally in the engines several years old.

Last, but fully as important, is the car owner. He may be one who slips his clutch, or "rides the clutch pedal." He may drive for a long time without properly understanding the use of the carbureter choke. He may drive with a retarded spark. He may allow the springs on his car to get rusty, or the gears to run dry and so on, all of which help to account for the statement made at the outset of this article that 25 per cent of the fuel dumped into the gasoline tank of the average car does no good whatever.

Putting aside the amount of fuel saved—if attention is paid to the foregoing items—there results a better running engine and car, a satisfied user and a better all-around use of automotive equipment. What has been said about passenger car engines and chassis applies equally well to trucks and tractors, especially the latter, wherein the engines have to work under full load all the time. Operating conditions of cars, trucks and tractors vary, of course, but the fundamentals of fuel economy are the same.



The new model F Cletrac operates on a floating roller chain. Drive is by sprocket arrangement. The bridge over the engine carrying the fuel and oil tanks and the water air strainer can be removed by taking out four screws. This gives free access to the cylinder head. The large plate in the rear can be easily removed, laying the entire differential assembly open to inspection.

## *Accessibility and Low Weight Distinguish New Cletrac Model*

*Ease of Disassembling Makes Maintenance a Simple Task;  
Single Oiling Point for Every Moving Part a Feature*

**F**EATURED by a wide range of adaptability and by a remarkably low weight, a new Cletrac has been added to the line of the Cleveland Tractor Co., Cleveland. The new model weighs but 1820 lbs. and measures but 80 in. in length, 50 in. in height and 32 in. wide. It is claimed to be capable of plowing from 6 to 8 acres a day with a standard, two-bottom, 12 in. plow, and also of handling any other of the usual farm tasks. To make it universally applicable, a two-row cultivator particularly designed for use with this machine has also been put on the market.

From a technical standpoint, the new tractor incorporates a great many new design features. It is particularly noteworthy as an example of accessibility and simplicity. The use of pressed steel parts has been carried to an unusual degree and is largely responsible for the lightness of the finished product.

A great part of the simplicity has been secured by so designing the tractor that there is no main flange. The engine, transmission and differential assemblies are so designed that they bolt together in one solid unit from front to rear. This construction not only gives an unusual degree of compactness, but also permits of marked accessibility.

The tractor differs in practically every particular from the other Cletrac. The only point of similarity is that both are tank or creeper types. In place of the

### **Features of the New Cletrac**

**N**O MAIN frame—engine, transmission and differential assemblies bolt together as one unit, giving compactness and accessibility.

Radiator core easily removed.

Bridge over engine removable, permitting free access to cylinder head.

Starting crank also used as gear shift lever.

Single oiling point for all moving parts.

Low weight, 1820 lbs. Use of pressed steel parts.

Price, \$845.

track running over wheels, it operates on a floating, roller chain, and the drive is by a sprocket arrangement. All of the parts which are subjected to stress are of chrome steel and practically the entire assembly is made up of pressings. These include such important parts as the track shoes, track frame, the roller chains, sprockets, radiator cover, fuel tank support and fenders. Altogether, there are 900 lbs. of pressed steel on

the tractor, and since the tractor weighs but 1820 lbs., this is about 50 per cent of the total weight. It is estimated that the use of pressed steel saves from 25 to 30 per cent in weight over the usual iron construction.

### **NOTABLE ACCESSIBILITY FEATURES**

The entire radiator core may be removed by taking out two screws and disconnecting the two hose connections. The core can then be pulled vertically out of the pressed steel core case, which, being a flange member, takes all of the stresses and eliminates any straining of the core. The core case is supported by a bridge to the transmission case.

This bridge, consisting of two longitudinal pressed steel members, carries the fuel and oil tanks and the water air strainer. The entire bridge with the tanks and strainer can be removed by taking out four screws and disconnecting the gasoline line. This leaves the engine head free for removal, or permits the operator to reach any of the upper parts of the engine assembly. Incidentally, the mounting of these tanks on the bridge at the upper part of the tractor puts the carbureter and air intake above the dust line and provides this installation at the cleanest part of the entire tractor assembly.

Another advantage of the location of the fuel tank on the bridge, is that it provides a straight gravity feed to the



carbureter, although this is mounted on top of the intake manifold, giving a down draft arrangement. This allows the heavy end points of the fuel to drop on the upper face of the hot-spot, giving a more complete utilization of the exhaust heat than would be possible by any other arrangement, as well as shortening the travel from the carbureter to the valve opening. This, of course, has the advantage of reducing condensation to a minimum. The temperature of the exhaust hot-spot is held at about 450 deg. Kerosene is used as standard fuel, although gasoline may be employed, if desired. The fuel tank is provided with a small auxiliary sub-tank for gasoline which is employed for starting.

Getting back to the subject of accessibility, which will probably be one of the first points to excite the attention of possible purchasers of this machine—the ease with which the various units can be removed can be illustrated by further examples. For instance, the gear driven fan, the helical timing gears and the cross-shaft for the magneto and water pump are all part of an assembly mounted on the front end of the engine. The water pump may be pulled out from the side by removing four bolts from the water pump flange. The water pump drive gear comes with it. Or, the entire front motor gearcase casting may be removed, carrying with it the timing gears, water pump, magneto and fan, as well as the power drive pulley. This leaves the entire front end of the engine open for inspection.

#### PERMITS OPERATOR TO WORK ON ENGINE IN VERTICAL POSITION

To reach the lower part of the engine, the oil pan which runs the entire length of the engine and transmission case, may be dropped, and then by taking out one nut from each of the front spring points, the entire tractor can be lifted up around the dead axle which acts as the suspension pivot point. This permits the operator to work on the engine in a vertical position. By taking off the main bearings, he can pull out the crankshaft, connecting rods, pistons, clutch shaft, flywheel, and then by taking off the back or transmission cover, all other inner parts of the engine are removable.

A little ingenious touch is the use of the starting crank for the gear shift lever. The starting crank cannot be removed from its gear shifting position unless the gears are in neutral. Thus, it is impossible to crank the engine with the gears engaged. Furthermore, it would be impossible to leave the starting crank in the field, because the gears cannot be engaged until the starting crank is fitted into position as the gear shift lever.

From the owner's and operator's standpoint, one of the most meritorious features of the new tractor is the single oiling point. By the use of the unit crank and transmission case, one oil point suffices for lubrication of all of the working parts of the tractor. On the earlier product, there is but one grease

cup and this is located on the water pump shaft, but will be shortly replaced by a packing gland which will do away with the only point requiring attention from the operator. By careful location of the oil filling point, the oil flows into the transmission case and then to the crankcase, so there is no possibility of dry bearings in the transmission when starting the tractor after a new supply of oil has been admitted.

The powerplant is a four-cylinder,  $3\frac{3}{4}$  by  $4\frac{1}{2}$  in. unit, particularly designed to use kerosene as fuel. On this fuel, 16 h.p. is developed at the normal speed of 1330 r.p.m. The maximum brake horsepower is 21. The horsepower at the drawbar is 9 and the gear ratio to the sprocket is 17 to 1. At 1600 r.p.m., the tractor travels 3 miles per hour, allowing for 3 per cent slippage. The engine is a four-bearing type, there being a large bearing on either side of the double central throw on the shaft.

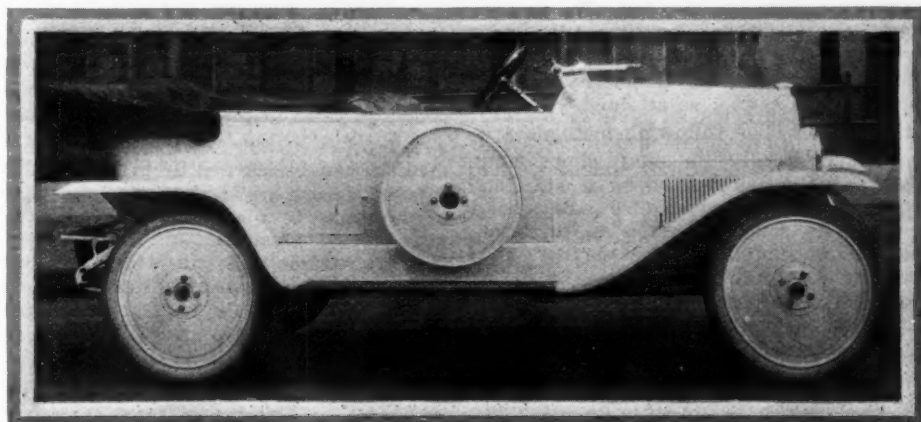
The pistons are three-ring, with a slot

to the solid support for the roller chain along the entire length of the tractor at the bottom, there is no sagging of the track in encountering rough going. The track forms the outer race. The frame acts as a solid support and differs from the wheel track support, which permits of some degree of sagging of the track between the wheels over inequalities in the ground.

The use of the floating, roller chain, upon which the track moves, eliminates the necessity for lubricating the track. The track shoes are formed cold from hardened chrome steel and so designed as to present a continuous solid tractor surface, which is self-cleaning. The tractor proper is suspended between the two track frames on coil springs at the front end and pivoted on a dead axle at the rear end.

The operator is seated in such a position that he can readily watch the work of his implements and this is partic-

### Fiat Presents An Overseas Design



The straight sweep at the top of the fenders distinguishes the Fiat line in appearance from the American cars. The maximum speed of this model is quoted at 42 m.p.h.

below the bottom piston ring land on each side of the piston to provide a drain back to the crankcase.

Steering on this Cletrac is similar to that of the other model and is accomplished by varying the ratio of speed between the tracks; but in place of gears and screws to tighten the steering bands, a positive cam and roller action is used, making a much simplified mechanism. This new type of brake control utilizes both steering bands and makes unnecessary the addition of a third band and drum for braking. Adjustments for wear are made by turning conveniently located screws which can be reached through hand holes without removing the rear housing power.

The driving sprocket for the track is located well up from the ground so that it is free from mud, grit or sand. The track runs upon a pressed steel track frame which is so formed as to provide an inner race for the floating roller chain, which acts as a bearing. Owing

ularly true with the Cletrac cultivator which has been particularly designed for this little machine. Unlike other cultivators, the power is applied to this model from behind, and the operator sitting in the seat of the tractor, looks ahead at the work rather than straight down. By this method, the lateral movement of the cultivating tool, ordinarily limited to a few inches each way, is increased to any range desired. A turn of the tractor steering wheel guides the cultivator accurately and the lifting levers permits adjustment within easy arms' length on either side.

It is claimed that this two-row cultivator can be attached to the Model F Cletrac by one man in two minutes. It has a 30 in. clearance and is thus able to handle corn up to 48 to 60 in. in height. The Cletrac Model F tractor is priced at \$845 and the Cletrac cultivator, which is adapted to it, \$135, both prices f. o. b. Cleveland.

# BURNING-IN METHOD OF FITTING ENGINE BEARINGS

*High Speed Process Eliminates Hours of Manual Drudgery and Results in Practically 100 Per Cent Perfect Bearing Fits*

BY WM. H. HUNT  
Editor of Clearing House

THE theory underlying the process of burning in bearings is that if a very thin skin of the bearing metal next to the shaft is heated almost to the melting point while the shaft is revolving, it will form itself to a 100 per cent running fit. Such perfection is, of course, impossible of attainment. However, the process approaches it closely enough for all practical purposes.

No hard and fast rules governing the work can be laid down, for the reason that apparatus speeds and the proper degrees of bearing pressures will vary with the sizes of the latter. As in everything else, proficiency comes after much practice and cannot be attained with one or two jobs. The following methods are used successfully in many shops and their explanation will form a starting point from which to acquire experience.

There is some difference in the procedure depending upon whether the bearing is of the die cast or the plain babbitt cast in place variety. In the first case it is best to remove any gears meshing with the crankshaft gear, for the reason that so much bearing metal may be shifted that the gears will not bind. If, after the burning-in, the gears mesh too deeply, the trouble can be easily remedied by placing shims under the bearings.

The fitting of plain babbitt bearings begins with the heating of the metal. Too high a heat will burn it and cause it to become too soft. On the other hand, if it is not hot enough it will chill upon striking the cold metal and fail to fill the backing completely. The proper

## The Question

*IN one of your past numbers you published a few articles on burning-in bearings. The directions were to run at high speed for a certain time. This was not clear to us as you did not say at what speed, whether at 1000 or 2000 r.p.m., the run should be made or how tight to draw up the bearings. Inform us as soon as possible.—The Automotive Co., Isabel, S. D.*

*In what issue did you publish instructions on the use of burning-in machines in the fitting of bearings?—S. H. Rudy, Hammond, W. Va.*

medium can be learned by practice only. Many old time repairmen gage the heat of the metal by plunging a stick of soft pine into it; when the stick chars lightly over its surface it is considered that the metal is ready to pour.

Main and connecting rod bearings had best be burned-in separately, the former first. In order that no time need be wasted, the connecting rods should be fitted to and aligned with the pistons and the whole assembly prepared in advance of the burning job. After the main bearings have been properly reamed with a bearing aligning reamer, or roughly hand scraped, as the case may be, the crankshaft is installed.

Fit No. 1 bearing very tightly by shimming, leaving a "rock" of from .004 to .006 in.; that is to say that, with the shims in place, it will be impossible to push the bearing cap down to them by

hand. The proper distance can be measured with a feeler gage. For instance, a distance of .005 in. on one side with the cap pulled down to the shims on the opposite side is equal to .0025 in. on each side when the bearing is exactly centered on the shaft. Should it be impossible to fit closely enough by shimming, the bearings may be dressed off on the edges.

Filing is not the best way to do the job for the reason that, no matter how expert the mechanic may be, the edges of the work are practically certain to be filed out of line, resulting in twisting when the cap is pulled down. A better way is to cut the edges down on a sheet of emery cloth glued to a perfectly flat hardwood block, sheet of glass or steel surface plate. Any workman can perform the job successfully this way.

After fitting No. 1 bearing, loosen it and proceed with the remaining ones, loosening each as it is finished. Sometimes a small high spot in the bearing will deceive one into the belief that the hole is tight. This condition must be guarded against. If such condition is suspected, the surfaces should be coated lightly with Prussian blue or lamp black and tried by installing the part, pulling it down lightly and turning the shaft.

High spots should, of course, be removed with the reamer or by hand scraping. Errors had best be made on the side of looseness until experience is gained, as with all bearings pulled down tight, the shaft is subjected to a tremendous strain, which may spring it. Although the actual burning is supposed to be done with the bearings dry, experience has shown that the application of two or three drops of oil just before the

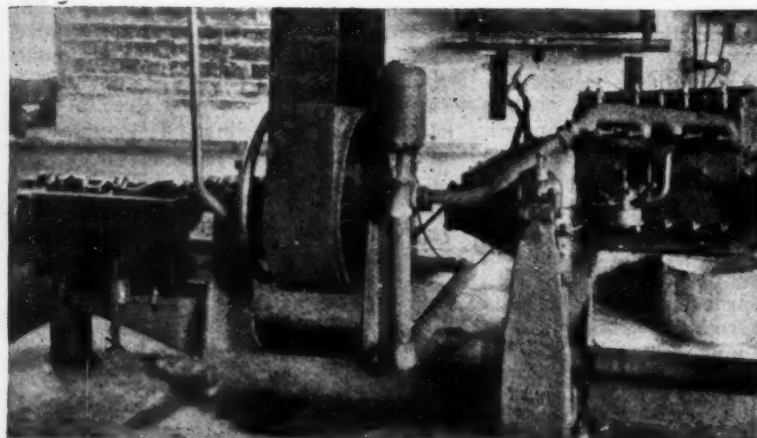


Fig. 1. A combination burner and running-in stand which performs the two operations simultaneously.

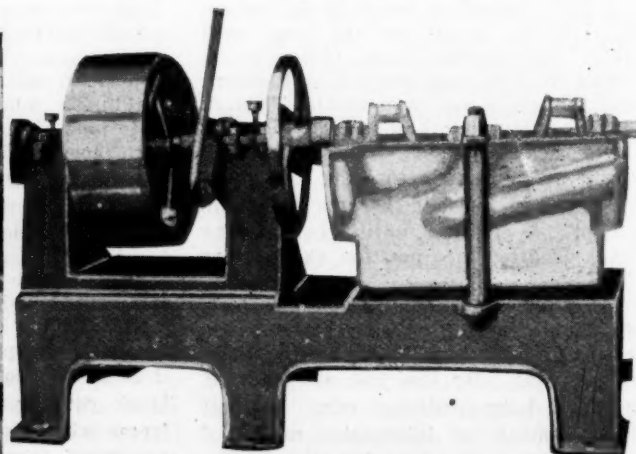


Fig. 2. Though less elaborate than the combination apparatus the single stand does entirely satisfactory work.



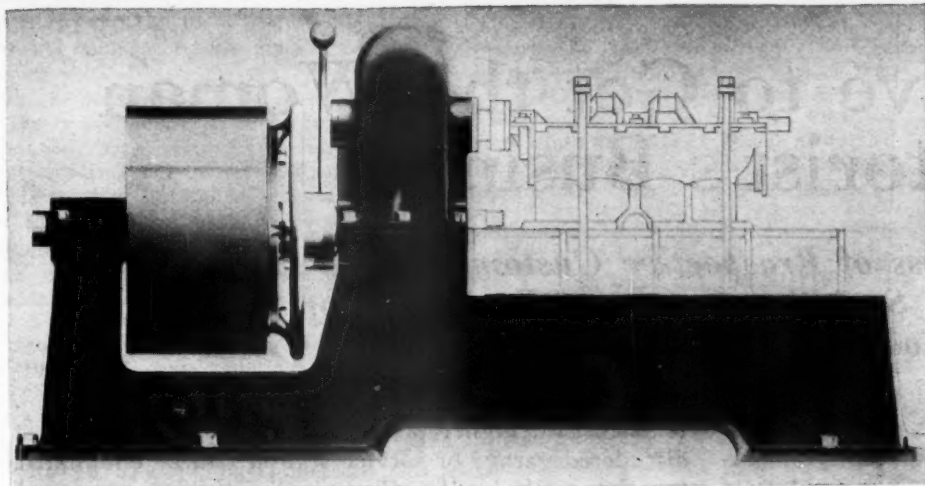


Fig. 3—A heavy duty burning-in stand of big enough capacity to accommodate the largest engines

bearing caps are finally tightened down, results in a smoother job. The next step is to pull the caps down to the limit.

The machine is started and run at from 175 to 200 r.p.m. for 30 to 40 seconds. The bearings are then examined for heating. If they have been properly fitted they should be smoking, scorching, to the touch and should cause water to sizzle when dropped upon them. If there are any which are not running hot they must be again fitted before the work proceeds.

If everything is progressing satisfactorily, continue the burning for from two to five minutes, the length of time depending upon the size of the bearings and the tightness of the fit. Ford bearings require three to four minutes. At the end of this time stop the machine and try the engine with the hand wheel, if the apparatus has one, or with a starting crank. A man of ordinary strength should be able to move the engine with one hand. Should this be impossible, the fitting is not complete and should be continued.

After the burning-in comes the running-in. This is done at a speed of from 300 to 500 r.p.m. with the bearings

flooded with oil. It can be accomplished in two to four hours, but may be continued as long as desired.

When the main bearings have been fitted they should be disassembled and loose particles of metal carefully cleaned from the oil grooves. Practically the same instructions apply to connecting rod fittings, the only extra care needed in the latter case being in dressing down the bearing edges on the emery cloth. Being much smaller than the main bearings, they are more easily thrown out of true.

It is well to relieve the tension on the main bearing caps a trifle while burning-in the connecting rods, as there is no need of subjecting the crankshaft and apparatus to the extra strain.

Another method which has met with success is to fit the bearings so that they have a great deal of rock and gradually to pull them down as the shaft revolves, watching them closely for heat. Aside from this one point the process is practically the same as outlined in the preceding paragraphs. When burning-in connecting rods it is very necessary that, though the pistons and cylinders and main bearings be flooded with oil, the

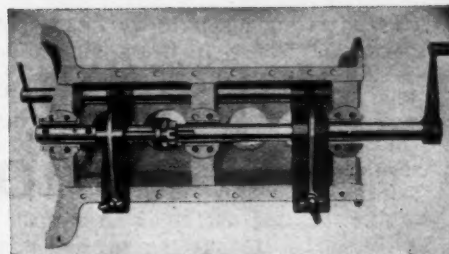


Fig. 5. The bearings should be hand scraped or reamed nearly to size with an aligning reamer like that in the above illustration.

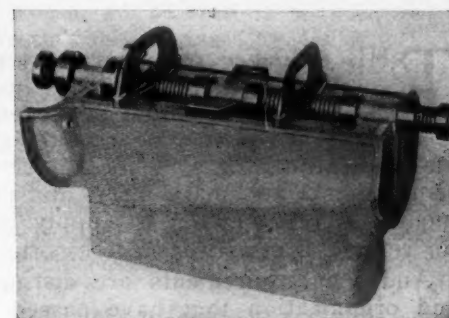


Fig. 6. By the use of a jig, such as that depicted above, three babbit bearings can be cast at one setting.

rod bearings must be kept dry until the running-in stage is reached. Should they get even a few drops of oil they will simply remain tight and will not "burn" at all.

Some shops are doing very well with home-made outfits assembled from old frames, engine bases and the like. However, like all makeshift apparatus these leave much to be desired, and it is better and in the long run more economical, to procure any one of several makes of burning-in machines which have been brought to a high degree of efficiency.

Some of these are illustrated in the accompanying cuts. Fig. 1 illustrates a very complete outfit which "burns in" at one end and "runs in" at the other, simultaneously. A less elaborate though no less serviceable apparatus is that shown in Fig. 2. Both of these are designed for Ford and Fordson tractor engine service. Universal outfits, so constructed that they will accommodate a wide range of engine sizes, are illustrated in Figs. 3 and 4. The large hand wheels on all of the foregoing are used to try the "feel" of the bearings during fitting and after the burning-in is finished. An idea of the power required for the job can be gathered from the size of the pulleys and belts. The average installation requires about 15 hp. to drive. An electric motor or gas engine makes a satisfactory power source and some shops have even utilized old car engines, connecting them direct with the apparatus through a clutch.

Supplementary apparatus are shown in Figs. 5 and 6. The first is a bearing aligning reamer which bores the bearings to parallel true with the lengthwise center of the cylinder block. It saves hours of hand scraping. The other is a babbiting jig used in casting new bearings when it is inadvisable to install or impossible to procure die cast ones.

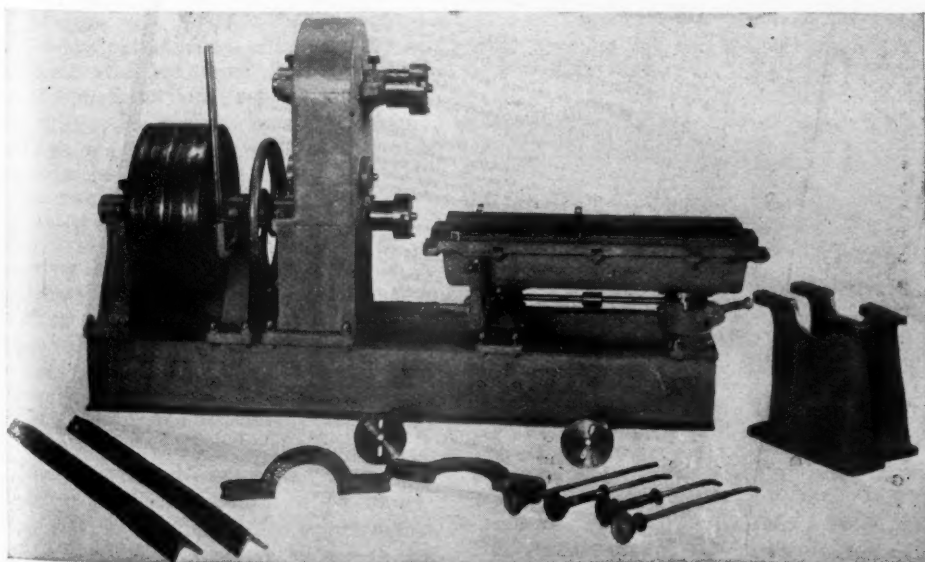


Fig. 4. Another type of universal stand designed for all sizes of engines. Burning-in is done with the geared down upper shaft and running-in with the direct connected lower one.

# Plan a Drive to Get the Woman Motorist's Business

*Here Is a Class of Prospective Customers That Has Been Growing Steadily—Get in an Early Bid for the Good-Will and Future Business*

THE influence of women drivers has begun to make itself felt in the field of automotive maintenance. Literally a host of feminine motorists is standing at the very door of the garage and service station waiting for someone to recognize its distinct requirements and make effort and provision in equipment and organization to supply its needs—be they for service, a new tire, or accessories.

And the requirements are distinct. The methods and organization that have passed muster with the man will not stand before the discerning feminine eye. The result of this scrutiny will be the raising of main-

tenance to a higher plane of efficiency. The careless disordered garage or service station will be eliminated, together with lax handling of the service personnel.

Many women hesitate to take their cars to a garage or service station, because of the apparent lack of consideration of the respect due her. Often women have been subjected to embarrassing moments. Much more willingly would she come in if greeted by one of her own sex. The presence of a woman in charge of meeting all feminine customers will also have its effect on the morale of the whole organization.

THERE will be more attention paid to cleanliness in the shop and appearance of the mechanics when making tests or diagnosing trouble. Restrooms will be made more comfortable and spotless.

The dealer or garage owner is overlooking a substantial source of profit if he fails to go after women's patronage. Not being of a mechanical turn of mind herself the woman driver depends on the service station for the proper care and operation of her car.

The confidence the dealer can inspire in his methods and organization will largely determine the success he will enjoy in dealing with women. Once they can be assured that their interests are being conscientiously served and they place trust in the recommendations of the dealer as to what equipment to purchase or repairs to have made, their patronage will be continuous. Dealers and garagemen who have made fostering the woman owner's patronage a substantial part of their efforts are emphatic in this one statement: she must be made to have absolute confidence in the advice given her.

Manufacturers long ago recognized that design and refinement of the car made must appeal to women. This influence can be traced through the growing popularity of the enclosed car—the coupe and sedan. Many of the large tire companies and car manufacturers have recognized the power women exert over the selection of the family car and equipment and place specially prepared advertisements in the periodicals published for women. These advertisements emphasize features of their product calculated to appeal to the feminine taste. If the big manufacturers with their sales research organizations see fit to spend large amounts of money to influence women, surely there can be no doubt in the dealer's mind as to the

## How One Dealer Is Increasing Sales

**TERMINAL GARAGE**  
**GOODYEAR SERVICE STATION**  
 TIRES, TUBES AND ACCESSORIES  
 "Terminal Service is Efficient Service"

Telephone: Edgewater 3034-3500 4464 Broadway CHICAGO, ILLINOIS

Mrs. Lewis P. Sale,  
 Chicago, Ill.

Dear Friend—

The way we look at it, equal suffrage means more than giving women a right to vote.

With us it means their privilege to think and to work—and to plan their own salvation here and hereafter.

Maybe we are not alone in reasoning of that sort—but we are confident we have the only automobile service station in Chicago maintained for the exclusive use of women—and conducted by women executives and drivers.

For eleven years now we have been specialists in electric garage service. And each year we have seen the business improve and expand. That of itself should inspire your confidence in us and our work.

And during those years we have learned this, too. It's no wonder the average woman who owns and drives an automobile dreads to go into a service station for even the slightest mechanical attention, or to have a tire changed or inspected.

You may have heard of the "Wonderful Woman in White" who went into a certain service station one beautiful summer afternoon. She took a seat on a dusty chair in the corner; a gray mechanic climbed all over the cushions of her spick and span new car; then later she drove away. But when she got to the party—good heavens—what a sight to behold!

Our woman's department, conducted by careful, competent and courteous women, for the convenience of all Chicago women drivers, is a thing really quite unusual. We are very proud of it.

Come in some day and try the novelty of buying a Goodyear tire, tube or a tire saver from a courteous saleswoman.

We handle Goodyear tires, tubes and accessories exclusively for the ladies just like we do for the men. It's equal rights for both on every service our complete establishment is prepared to render.

Yours sincerely,  
 TERMINAL GARAGE  
 (Mrs.) Fred Daniel  
 Mgr.

GOODYEAR SERVICE STATION  
 P.S.—We pump up your tires, no charge.

The above letter is a good example of what a dealer or garage owner can do to stimulate the interest of women drivers in his organization and methods of caring for their cars. Write a letter similar to this and mail it to your list. The result should be interesting and profitable



potential purchasing power of this growing class of car and accessory buyers.

An incident of recent occurrence tends to typify the good-will and future business that may result from an intelligent handling of women's patronage. A woman driver entered a certain garage for the first time to have some minor adjustments made to an irregular running engine and was met by the service manager, who courteously ascertained her needs, and ordered a mechanic to correct the fault. He noted that one of the tires was running soft and directed that it be properly inflated. He also looked to see if the radiator had sufficient water. These were small incidents, to be sure, but impressed the woman that here was a garage where her interests would be safeguarded.

On relating this experience to her husband he at once visited the service station and thanked the manager for his courtesy and assured him of his future business. No small amount of business has resulted from this one instance, and it is but one of many where profits have been made by considering the woman driver.

A few months ago *MOTOR AGE* called attention to this growing factor in an article titled the "Wonderful Woman in White," a phrase originated by Percy Chamberlain, service manager and lecturer on better service methods. Since then a number of examples have been called to observation of how dealers and garages have capitalized this story. One example is shown in the letter reproduced on this page sent out by the Terminal Garage, Chicago, to its mailing list of women customers, actual and prospective. This garage has found catering to women drivers a profitable procedure and has planned special features to attract feminine trade. A woman is in charge, a woman attends

to the accessory sales and women car cleaners are employed.

It has been found in this garage that women car cleaners take a certain pride in turning out a car just so, with the added feminine touches which a man so often considers unnecessary. Extra precautions are taken to see that the

## I Never Thought of That—

**T**HAT is what many dealers and garage owners were compelled to admit when asked as to what they were doing to encourage women motorists to patronize their place of business. Now is a good time to think about it and start doing something to direct this flow of sales through your cash register.

This article outlines a simple plan to start with. Read it and see how it stacks up with the potential number of women buyers in your territory that should be buying from you.

mechanics do not soil the upholstery when working on a car.

Mrs. Daniels, manager, says she is surprised to note the great interest women take in the proper care and appearance of their cars, and particularly their tires. The tire repairman was chosen because of his courteous manner and readiness to explain the cause of undue tire wear or leakage.

### PUTTING THE IDEA INTO PRACTICE

The first step in attracting women's trade is to hire a woman attendant. Her salary may incur no additional expense. She can attend all accessory sales, assist with the bookkeeping and cour-

teous handling of telephone calls, BUT she should meet all women customers entering your place of business, ascertain their needs and if the service manager or a mechanic is necessary to diagnose the trouble, remain at the woman's side, until all the details of repairing have been written.

That a restroom for patrons waiting on minor car adjustments is necessary, is a foregone conclusion. Here the woman attendant can put the waiting customer at ease and perhaps even make suggestions leading up to accessory sales.

Women are inclined to be talkative. We have this confirmed by Mrs. Daniels of the Terminal Garage. But this can be turned to an asset by a woman service attendant of even temper and diplomatic methods. The foregoing service directress makes it a point to greet every woman customer and engage in a chatty conversation while her car is being attended. A woman a wee bit lonesome finds it a treat to visit the garage.

Nearly every dealer has a mailing list of customers. The Terminal Garage has one with 2,300 names, to which a letter is sent each month. It has been found by the concern that a letter a month produces the best result. If sent oftener letters are regarded as a nuisance and if too much time elapses between letters the cumulative effect of the preceding one is lost.

Three letters were used in this campaign to draw women buyers, one of which is reproduced here.

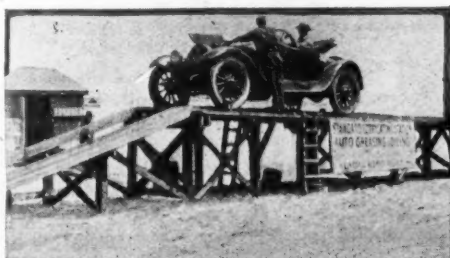
Plan a letter with the interest of women drivers in mind. Have your woman service attendant go over it with you and inject some of her ideas into it. Then send this letter to the wife or daughter of every owner you know. The plan has been found profitable, it's worth trying.—Write *MOTOR AGE* and tell how it worked for you.

## A Growing Branch of Specialized Service

**S**PECIALIZED service continues to branch out in the larger cities. Where the maintenance shops or garages formerly attended to all the car owner's needs, such as tire repairs, batteries, electrical equipment, oiling, greasing and washings, we find factory service stations repairing and adjusting their particular equipment or independent specialist singling out some line of automotive maintenance and setting up in business. One of the latest offshoots of this has been the oiling and greasing stations making their appearance on many vacant lots facing busy lanes of motor travel. These stations are constant reminders to negligent car owners of the vital need of having their cars oiled and greased occasionally.

The educational value of these constant reminders should not be underestimated. Manufacturers' instruction books and dealers' advice to purchasers have always laid heavy emphasis on the absolute necessity of oiling and greas-

ing the springs, shackle bolts and wearing parts of the undergear. But owners won't do this messy job nor do they wish to have their cars laid up for hours



One of the many oiling and greasing stations fast making their appearance in the larger cities. The service is quick and efficient. The car is driven up on the structure and the attendants immediately set to work filling grease cup, oiling springs or changing the crankcase oil. The owner drives away with a thoroughly oiled car

at the service station waiting to be lubricated, and in putting off the ordeal it is soon forgotten. A hard riding car and a big repair bill is the ultimate result.

These oiling and greasing stations are easily built, being nothing more than elevated wooden roadways with inclines at both ends. Their height enables the mechanic to reach all underparts without assuming tiresome positions.

The dealer or maintenance shop can expedite service by building such a track for oiling customers' cars, in the repair shop, or could erect one at the side or back of the garage, where it would attract the attention of passing trade, and add this source of revenue to his profits.

Car owners are inclined to forget to oil their cars until serious damages result and then blame the car or the dealer who sold it to them.

This service "While You Wait" appeals to the average busy man or woman.

# INTAKE MANIFOLDING

*Properly Applied Heat Does Much to Minimize Condensation, "Loading," and the Pernicious Dilution of the Crankcase Oil*

**A**FTER all is said and done, scientific manifolding cannot entirely overcome the shortcomings of the heavy fuels. Something else is necessary, and that something is the proper application of heat. This proposition is simply stated, but the simplicity does not obtain beyond the statement, as it has been found that the determination of what constitutes proper application of heat is a complex problem which cannot be solved off-hand by installing various kinds of heating units in, under or around the manifold or carburetor, at the caprice of the car owner.

It is a problem which is calling forth the best thought from the best brains of the automotive industry, both at home and abroad. All interested in this problem are familiar with the first apparatus for the application of heat. These consisted of simple "stoves" placed around the exhaust manifold or installed so as to bear directly against one of the cylinders, from which the heat was lead by pipe or flexible tube to the carburetor air intake.

Although the use of the stove is mentioned in the past tense, it is still with us and it is doubtful whether we could get along without it. However, no matter how well it may have served and is still serving its purpose, it is rapidly becoming inadequate, for the reason that it operates best at high air velocities, when it is least needed, and poorest at low velocities, when the need for it is greatest. This results in a considerable loss of power at high speeds, if the supply is adjusted to give the best results at low speeds.

These limitations of the device have long been recognized and other means of the heating of the mixture after it is made, are being developed. Perhaps the simplest of these is the electrically heated vaporizing devices which are in-

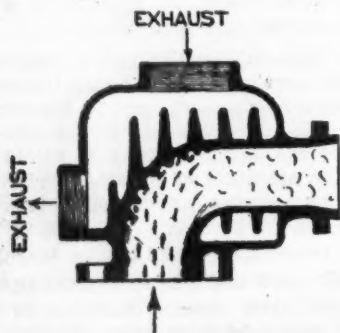


Fig. 2—One of the hot-spots put on the market recently

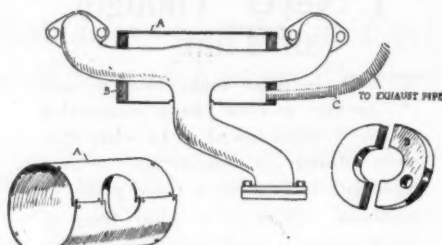


Fig. 1—An early attempt at hot-spotting which gave some good results

stalled at the flange between the carburetor and the intake manifold. Without doubt, these contrivances aid greatly in producing a more homogeneous mixture and minimizing condensation.

Of the two effects, it is probable that the first is most pronounced because of the thousands of passages of the resistance units employed, be they in the form of criss-cross grids, spirals or what-not, which serve to break up the globules of fuel and mix them more intimately with the air. That the amount of heat which they impart to the mixture is negligible is acknowledged by their manufacturers, who advise that they be turned off after the engine is well warmed up. The principal claim made for them, well substantiated by their

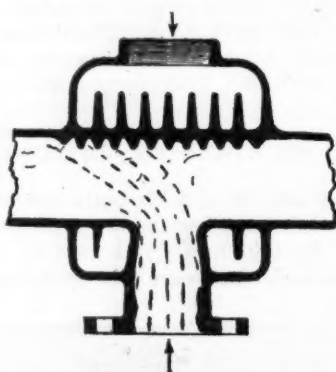


Fig. 3—Another form of the manufactured hot-spot. This follows the same principle shown in Fig. 2

consistent performance, is that they aid greatly in starting cold engines.

Another form of electric heating device which has received a thorough trial is designed for insertion into the carburetor float chamber and is intended to heat the fuel nearly to the vaporizing temperature before it passes to the spray nozzle. Regarding devices of this nature T. C. Mock, Engineer of the Stromberg Motor Device Co. has the following to say:

"As to the first (the method under discussion), we definitely and positively ad-

vise against any attempt to heat the fuel in the float bowl of the carburetor, because of the fact that there are fuels in many sections of this country containing a small percentage of very volatile elements, casing head gasoline being a sample. The amount of heat that is necessary in the carburetor to handle the heavier elements will make these light elements boil rapidly in the jet, which totally upsets the metering of the carburetor, causes the engine to backfire and practically makes the car unusable until the heat supply is removed."

The foregoing is a rather sweeping condemnation of a device which other engineers have found serves a useful purpose, if no other than that of making starting easier, thus saving wear and tear on the starting battery and, to an extent, minimizing condensation. However, it seems to be the consensus of the engineering fraternity.

The only remaining method then of applying heat is through the manifold walls after the mixture has left the carburetor. Many applications of the principle have been worked out, from the simple water-jacketing of the manifold to a very elaborate system of "hot-spotting," used on the latest model of Dorris car. Of this more will be said later. Like the stove, water-jacketing has served its purpose admirably in the past, but its limit of adequacy has been reached some time ago and it has been found necessary to apply a greater volume and intensity of heat than the cooling water is capable of transmitting.

This brings up the subject of "hot-spotting." An early attempt and one

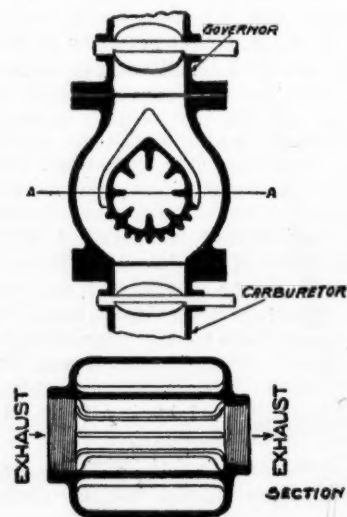


Fig. 4—Showing installation of hot-spot on a truck fitted with a governor in the manifold



which gave remarkably satisfactory results is illustrated in Fig. 1. The simple sheet metal shield surrounding the manifold at the branch was heated by a blast of exhaust gas by-passed from the exhaust manifold by means of the flexible tube. Though perhaps not scientifically correct, it minimized condensation and thus served its purpose. There being no way to control the amount of heat transmitted, it is quite likely that an over-supply was furnished which sadly interfered with volumetric efficiency. Despite this, the device is recommended in lieu of the much more expensive special manifolds. A great deal of careful engineering thought is evidenced by several of the "hot-spotting" devices placed on the market during the last two years.

One of these is illustrated in Fig. 2. This one occupies a position on the manifold bend because it is at this point that the heavier fuel particles tend to fly outward and come in contact with the wall. The exhaust gases are led in at the top and discharged horizontally, thus parting with most of the heat at the point where the mixture has been slowed down the most. The flanges are true radiating members and they transmit a much greater proportion of the heat than would the plain pipe.

Fig. 3 shows a further development of the same idea. In this case the carburetor is of the vertical type, and condensation takes place to the greatest extent at the center of the transverse branch; therefore, the heat is applied at this point. The exhaust gases are taken in at the top and discharged through a port in the rear, not shown. It will be noted that the idea of the radiating flanges has been elaborated upon, as they are supplied within the manifold as well as upon the outside. At first glance the more complete radiation of the heat seems to be the only office of the internal flanges. Such is not the case, however, as they have a valuable secondary effect—that of retarding the movement of the heavier constituents of the fuel until they have been completely vaporized, the lighter portions passing on unhindered.

The question will arise—how large should the heat supply pipe be and is it necessary to lead the exhaust gases back to the exhaust manifold after they have performed their work?

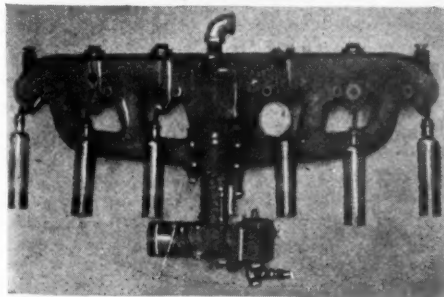


Fig. 6—An improved type of manifold in which the admission pipe is cast integrally over the exhaust pipe, thus securing better vaporizing of the heavy ends

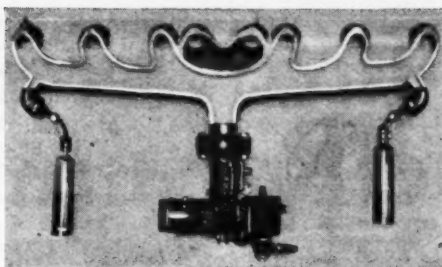


Fig. 5—An admission pipe of a six-cylinder engine in which the two exhaust ports at the center form a hot-spot immediately above the carburetor inlet

The reply to the first is that the conduit should be as short, direct and large as is practicable. Regarding the last, it is merely a matter of personal choice. The outlet pipe may be as small in diameter as  $\frac{3}{4}$  in., one of the remarkable phenomena being that the cold walls of the intake manifold abstract so much heat from the gases that they contract to a small volume and issue at a comparatively low temperature and pressure. They are, therefore, practically noiseless: This is true of the apparatus mentioned and of those to follow.

Fig. 4 shows an installation which is recommended for motor trucks equipped with a governor. Many trucks have gravity feed, and in order to leave room for the governor, the carburetor is placed quite low. This results in an exposed vertical pipe a foot or more in length which is an ideal condensing chamber. The heating element is located between the carburetor and governor and is so designed that incoming gas is compelled to pass around an internal

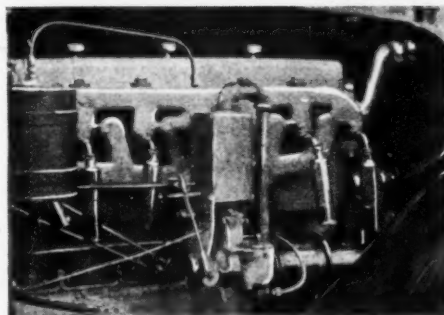


Fig. 7—Another type of admission pipe which is placed over the exhaust pipe and separated from it by air spaces

transverse tube which constitutes the "hot-spot."

The device should be installed in such a way that the axis of the tube is at a right angle to that of the throttle butterfly so that at partial throttle openings the mixture is forced to strike the heated surface. More care must be exercised in this installation than is needed with a like one on passenger car engines, to be certain that the exhaust gases actually reach the "hot-spot." The reason for this is that the travel of the hot gases is usually much longer, many times a foot or more, and unless the

supply pipe is of very generous dimensions, the friction will be great enough to slow down or practically cut off the flow entirely.

Then again, the long pipe, having a great deal of radiating surface, will part with the major portion of the heat unless it is wrapped with some sort of heat insulating material, such as asbestos. If sufficient heat is not supplied, the device will be practically useless at small throttle openings, when there is greatest need for it, and only operative at wide throttle openings, when it is needed least. It is sometimes even found necessary to constrict the exhaust pipe by means of a bushing or baffle plate so as to force the hot gases to pass through the "hot-spot."

A strong argument in favor of the "hot-spot" is that, being of small area, it raises the temperature of the incoming charge not more than 20 to 30 deg. Fahr., and therefore, does not so expand it that volumetric efficiency is interfered with. What little interference there may be is more than compensated for by the greater power developed by the better mixture, the cutting down of carbon formations and crankcase dilution and the almost total elimination of spark plug fouling.

The latest practical application of "hot-spotting" has been developed by G. P. Dorris, president and chief engineer of the Dorris Motor-Car Co. Dorris has conducted hundreds of experiments with the induction systems pictured in Figs. 5, 6, 7 and 8, the results of which, according to the claims, is that carbonization has been greatly reduced and crankcase dilution completely eliminated.

Fig. 5 illustrates one of the early experiments in which it was found that before the "hot-spot" in the center became sufficiently heated, two ounces of the heavy parts of the fuel collected in the bottles connected to the ends of the manifold. Even after the engine became warmed up to the proper running temperature the bottles continued to fill slowly, proving that under ordinary conditions these unmixed, heavy portions passed to the cylinders in the fluid state.

The next step is shown in Fig. 6. In this, the intake manifold was formed

Concluded on page 37

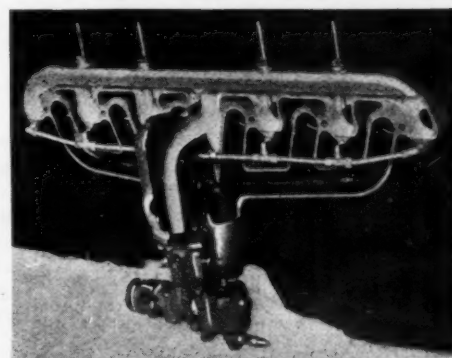


Fig. 8—Sectional view of the admission pipe shown in Fig. 7 with one-half removal to show the pipe employed to return the heavy fuel ends of the center pocket or vaporizing still

# Practical Tire Merchandising and Repairing

by Stanley P. McMinin



## Fabric Tire Repairs

*Regular System of Inspection  
How to Detect Rim Cutting*

*What Sand Blisters Indicate  
Watch for Fabric Separation*

*Injuries to the Inside*

**T**HE one all important fact that every repairman should keep constantly in mind is that no tire should ever be repaired unless there is enough wear left in the tire to make the repair worth while. In other words, never permit a customer to spend money uselessly on a casing. To do so is the quickest and surest way of losing the customer.

Careful and systematic inspection of casings is the first step in repair work. There is nothing particularly difficult about this and almost anyone can readily detect injuries if he knows just where to look for them.

Injuries to the fabric may be caused by some foreign body being forced through the tire, in which case the location of the trouble and the cause are very easily determined. However, if the injuries are caused by stone bruises or by running flat or some other such cause, there may be no external indication of the trouble, and it is in such cases as these that the most careful inspection is necessary.

### REGULAR SYSTEM OF INSPECTION

It is a good plan to have a regular system of inspection. For example, go all over the outside of the casing, carefully watching for small cuts and for pieces of metal or sharp stones which may be embedded in the rubber. Next, lay the tire flat on the bench and inspect for rim cutting.

Due to the perfection of rims and casings, rim cutting will seldom be found in straight side tires or in the larger sizes of QD tires. However, the smaller sizes of clincher tires, 30 x 3, 30 x 3½ and 31 x 4 are very easily rim cut.

### HOW TO DETECT RIM CUTTING

The rim cut is not always easy to determine. It may consist of broken fabric under the thin outer covering of rubber. However, there is generally an indication of this condition, due to rubbing of the tire on the rim.

A clincher tire which fits its rim perfectly and which is run properly inflated will not rim cut. The greatest cause of rim cutting is bent rims. When it is considered that if a clincher rim is bent

1/64 in. it will cause a tire to rim cut, even if properly inflated, it will be seen that where rim cutting exists the rims themselves should be carefully examined and straightened before another tire is applied.

After one side of the tire has been inspected for rim cutting it should be turned over and the same procedure followed on the other side.

Occasionally a tire may appear to be rim cut when it is not. In other words, it may be that only the chafing strip is injured or that the chafing strip is separated slightly from the next layer of fabric, thus giving the appearance of a rim cut.

In this connection, however, it is well to bear in mind that some makes of tires are built without a chafing though most of them have it.

### WHAT SAND BLISTERS INDICATE

In the external examination of a tire the inspector should watch very carefully for bubbles or blisters. These may be caused either by an accumulation of sand between the tread and the fabric or by pulverized cushion stock.

If the blister contains sand it is a certain indication that somewhere in the tread there is a break through which the sand entered. It should be opened at a point farthest from the tread and the sand carefully removed. If the blister contains pulverized cushion stock this is a fair indication that the tire is defective or that it has been run under-inflated for a considerable time.

### WATCH FOR FABRIC SEPARATION

If there is only one small blister which contains pulverized cushion stock it should be treated in the same way as a sand blister, but if this condition appears quite general and there are a series of blisters nearly all the way around the tire, it is almost hopeless to attempt to make any sort of repair because the tire will not last any length of time no matter what is done to it. However, such tires can sometimes be successfully re-treaded.

Blisters on the outside of a tire are also an indication of fabric separation, or in a cord tire of cord separation. If such separation is purely local it should not be any bar to a successful repair,

but if it is general in character and extends through several layers of fabric or cord, no attempt should be made to repair the tire, because it is impossible to locate the weak spot and it is at the weak spot that it will go very soon.

Fabric separation can be determined by buckling the tire over a mandrel or over the edge of the bench and by closely watching the fabric as the tire is bent slightly back and forth. If there is separation the plies will be seen to move one on the other.

Tread separation is slightly different from fabric separation and may be the result of the same causes—external injuries which allow sand and water to go between the tread and the fabric, or pulverized cushion stock. Local tread separation can be repaired, but a general separation of the tread all around the tire is a fairly good indication that the tire is about done for.

### INJURIES TO THE INSIDE

Injuries to the inside of the tire are generally plainly apparent. The best way to examine a tire is with a tire spreader which opens the tire out flat and exposes the entire inside a section at a time.

Open breaks in the fabric should be marked preferably with a grease crayon for quick location when a repair is to be done. Nail holes should be marked in the same way.

Tires that have been run under-inflated or that are stone bruised will exhibit what is called "checking" of the fabric, shown generally in a great number of places, often circumferentially around the tire a little bit higher than where the top of the rim comes. A stone bruise shows a small checked area which may be either in the center of the tread or in one of the side walls.

Tires that exhibit general checking should be discarded and no attempt made to repair them. Local checking, however, can be repaired successfully. In brief, checking is an indication that the fabric has been badly strained. In consequence of the hinging action which results as the tire rolls over the road under a load, the weakened place will give way sooner or later and become a blowout.

Occasionally separation will be found



where the plies of the fabric are lapped together in manufacture. This is not a serious injury if only the top ply is separated.

The method of repairing such a break is to pull the ply back as far as possible and thoroughly buff both the ply and the underlying fabric, which should then be washed with benzol and allowed to dry thoroughly; then two light coats or one heavy coat of vulcanizing cement is applied.

When the cement is dry enough to be tacky, the ply is laid back in position and stitched down. A narrow strip of cushion stock about  $\frac{3}{4}$  in. wide should be stitched down to cover the lap. The whole repair is then dusted with soapstone and cured.

The curing may be done either on the arm or in a sectional mold. It is best, however, to use the arm because there is then no danger of marring the tread as a result of the pressure. Such a repair should be cured about 25 minutes at 50 lbs. steam pressure.

In repairing sand blisters the first step is to remove the sand by cutting a narrow slit at a point farthest from the tread; the flap of tread should then be propped up with a couple of short pieces of wood. The fabric, if damp, should be allowed to dry thoroughly before any

further work is done. Drying can be hastened by hanging the tire over the vulcanizer or inserting it part way in a cavity.

If the fabric is in good condition it should be thoroughly cleaned on the buffing wheel, wiped out with benzol and cemented after the benzol has dried. Both the fabric and the flap of rubber should be given a heavy coating of cement.

When the cement has dried properly, the flap of rubber is stitched down in place with a beaded stitcher. It is well to puncture the flap in several places to make sure no air is imprisoned under it. Should the flap be slightly short so that it does not make a perfect join, the interstices should be filled flush with little scraps of tread stock thoroughly stitched in place. A job involving the use of little or no tread stock will cure properly in a cavity in about 30 min.

#### USE OF "NEGATIVE PADS"

The combination of heat and pressure in a cavity will flatten a raised non-skid tread, and for this reason some means must be taken to preserve the pattern.

Perhaps the simplest method is to fill up all the holes in the tread with a stiff

paste made of water and soapstone. Obviously, this method can be used only where no extensive repairs have been made to the tread.

Where the tread has been considerably repaired and a lot of new tread stock applied it will be necessary to use what is called a "negative pad" to form the new tread stock into the same pattern as the tire and to preserve that part of the tread which is squeezed in the mold.

#### VULCANIZING SMALL TREAD CUTS

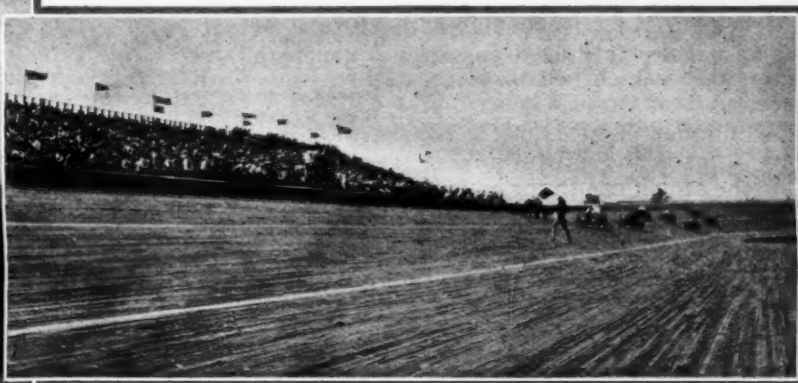
Perhaps the simplest job the repairman will be called on to do is filling up tread cuts of various sizes. Injury to the tread allows water and sand to get at the fabric, thus rotting it, and inducing blowouts. Therefore, it is of the utmost importance that all extensive tread cuts be properly cured at the earliest possible moment.

There are various forms of plastic rubber on the market for filling such tread cuts, but this material is generally of service only for making a temporary repair. It can seldom be applied in such a way that it will stay put for any length of time. Vulcanizing is the only really effective way of sealing tread cuts.

This Article Completes the Tire Series



Joe Thomas with the mascot that failed to make good—Joe had the misfortune of breaking an intake valve. But for this he would have made a better showing than sixth place—Mascot for sale



Paul Derkum signalling the start of the 150-mile record-breaking contest at Northbay Speedway recently. This track is extremely fast and great things are expected of it at coming events.

## A Speedway That Promises Better Than 115 Miles Per Hour

Hearne, driving a Distel-Duesenberg, reeled off the 150-mile event in 1 hr. 21 min. 19½ sec., an average speed of better than 110 m.p.h. Hearne turned the bowl twice in this race at 115 m.p.h.

Many of the drivers predict that even this speed will be surpassed when they have become accustomed to the eccentricities which every speedway manifests at terrific speed.

The Indianapolis brick oval still holds its supremacy as the battleground for international racing honors because of the greater hardships imposed on car and driver in a 500-mile event and the greater driving skill required on this course

with its turns not banked as steep as those of later construction.

With major speedways at Uniontown, Tacoma, Indianapolis, Cotati and Seattle we may look forward to seeing new racing honors bestowed, new records set and unheard of drivers suddenly bursting into stellar positions.

Many dealers and distributors are of the opinion that stock car races are of greater value in bringing the prospect up to the decision of buying than are the contests of specially-built speed cars, but the fact is plainly evident that the public takes a greater interest in the speedway battles of cars capable of traveling over 90 m.p.h.

WITH speedways being erected in many cities, interest in automobile racing and its practical lessons is manifested by dealers, owners and prospective owners to a greater extent than heretofore. The pictures on this page show part of the 30,000 spectators attending the opening of Jack Prince's latest 1¼-mile speedway at Cotati, Calif., to be known as the Northbay Speedway.

Records were demolished when Eddie



# EDITORIAL



## Ohio Anti-Theft Law

**A**N interesting experiment is being conducted in Ohio, where it has been decreed that the ownership of an automotive vehicle shall be recorded, very much like the ownership of real estate. The purchaser of a car or truck will receive a bill of sale that shall be recorded with the proper county official. Then when this owner sells this vehicle, the purchaser must have the change of ownership recorded.

This move, of course, is intended as a blow at the traffic in stolen cars. Used car dealers in Ohio are inclined to protest this plan of action, under the belief that it will be the cause of much trouble to them and will bring upon them a heavy expense. Probably this position is correctly taken, but it may be that this situation is not as serious as it appears. Any change in the regular procedure is apt to look alarming. Probably the expense of this trouble will not be nearly so great after a few experts in automobile titles develop. No one considers the formalities attached to a real estate deed an especial hardship, and an automotive vehicle will average well in value with the mass of real estate deeds.

For a number of years there has been a desire on the part of many thoughtful men to try out some such cure for the stolen car traffic as is outlined in the Ohio law. Dealers and others involved should not condemn this law off-hand, because it causes some trouble to them. Their attitude should be that of willingness to give to this experiment a thorough tryout. If the cure is worse than the disease, then change it. It is difficult, however, to think of any cure that would be of more trouble to the industry or to any individual dealer than the present liability of being innocently entangled in the stolen car traffic. Also the liability of a car being stolen is one of the greatest sales resistants today confronting the industry and the individual dealers.



## Why a New Distributor?

**R**ECENTLY a factory sales manager was asked why he had replaced a distributor in an important center. The inquirer knew that the man who lost the franchise had made at least a fair record for selling cars and that his selling methods were clean. The answer might be surprising to some, but it will not be to all. It was about like this:

"I was rather new on this job, but I began by looking into the service, knowing that our big job is with the future. I quickly found that the distributor that I have replaced was not interested in maintenance, consequently his service was below par. I tried to interest him in proper service, especially in equipping a maintenance station adequate to handle the number of cars we had in his territory, and especially a shop that could handle the jobs that most frequently are

called for on our car. But he was not interested. Consequently we are making the change."

Congratulations are in order for this sales manager. He is looking to the future and is building it. He knows the weaknesses of the product he is selling and is planning to care for these weaknesses. He was not entirely fair to himself in describing his course of action. Really, the first thing he did on this sales job was to ask the factory maintenance department to point out the weaknesses of the car he was to sell. When he obtained this report, he went to the engineering department and asked how many of these weaknesses could be cured in three months. He got action there and he has left with the engineering department the rest of the list for future action. After this job was fairly on its way, he tackled the maintenance in the field.

But we submit that his biggest maintenance job was in getting action from his own engineering department to cure the weaknesses at the source.



## Looking to the Future

**I**T IS rather a dismaying prospect that looms when one sits down to think of the work that is ahead of the automotive industry if it is to render properly the service it owes to its almost ten million owners.

Recently we have passed through the open season for state legislation and the number of unfair and freak bills directed at the automotive industry and its customers ran very high. This number, however, was fewer than two years ago, and in the main the bills were not quite so freakish as formerly. This indicates that automotive transportation is commanding more respect from the average legislator than it has in the past. Especially is the idea that all automotive products are luxuries, on the wane.

Now we are seeing a series of doubtful and silly municipal ordinance proposals. Not all of the proposals are foolish, some of them are very good indeed. The trouble is that the average legislator is not well educated in automotive affairs. It frequently happens that the best informed man on automotive affairs in a municipality is a dealer or maintenance man. When that is the case, this man, representing the local organization, should undertake the necessary education of the legislators.

Matters of traffic regulation, accident prevention, parking, theft and commercial respect for the industry are largely local. The automotive business men of the community should be aggressive in spreading the proper information, in seeing that their ranks are kept clean of fraud and that the mis-information that so often attracts most attention is properly and promptly answered. All of this calls for organization and for individual sacrifice. What good is accomplished is for the general good. Our industry is new and still misunderstood. The need is great and the workers all too few.



## 333 Automobiles to 1000 Farms in U. S.

### Two Farms Out of Every 100 Used Motor Trucks in 1920

**Bureau of Census Issues Statistics  
Covering Use of Motor Vehicles  
in U. S. Agriculture**

WASHINGTON, Aug. 28—Statistics compiled by the Bureau of the Census, Department of Commerce, as of Jan. 1, 1920, show that 30.7 per cent of farms in the United States have automobiles. The data proves the utility of the motor vehicle, for it shows that of the 1,979,564 farms reporting there were 2,146,512 automobiles in use Jan. 1, 1920, or 332.9 automobiles per 1000 farms. The Federal figures also show the popularity of motor trucks and tractors on farms. About two farms out of every 100 in the United States as a whole possess motor trucks. Motor trucks were reported on 131,551 farms in 1920, making a total of 139,169 trucks in use on that date. Pennsylvania led the field with 9372 motor trucks in use on farms; New York with 9259; Iowa, with 8910; Ohio, with 7319; Nebraska, with 6548; California, with 6416, and Illinois, with 6154.

Automobiles were reported by more than one-half of the farms in eight states, namely, Nebraska, Iowa, South Dakota, Kansas, Minnesota, North Dakota, California and Illinois.

The following states reported more than 100,000 automobiles on farms in 1920; Iowa, 177,558; Illinois, 139,090; Ohio, 128,384; Kansas, 111,055; Minnesota, 107,824; Texas, 105,292; Nebraska, 104,453, and Indiana, 102,122.

### Salesmen Have Conducted Active Campaigns

It must be remembered that these statistics were gathered as of Jan. 1, 1920, and more than 18 months has elapsed since the compilation. Therefore, the data cannot be considered as indicative of present conditions, for enterprising salesmen have conducted active campaigns in this period and as a consequence thousands of machines have been added to farm equipment. Neither can the figures be regarded as comprehensive, because they are based on only 30.7 per cent of all farms and as reports have not been received from an impressive majority, the figures cannot be used in any accurate determination of motor vehicle sales.

The record of the Bureau of the Census shows that one farm out of every 28 owns a tractor as of Jan. 1, 1920. There were 246,139 tractors in use on 229,334 farms on the census date. More tractors were in use in Illinois than in any other state, as statistics show 23,102 tractors in that state, with Iowa next, possessing 20,270 tractors; Kansas, 17,177; Minnesota, 15,503; California,

13,852; North Dakota, 13,006; South Dakota, 12,939, and Nebraska, 11,106. These eight states reported more than one-half of all tractors on farms in the United States. For the country as a whole, there were 38.2 tractors for every 1000 farms in 1920, and for the eight states above mentioned, taken together, 106.8 tractors for every 1000 farms.

The states with the highest percentage of all farms reporting tractors in 1920 were as follows: South Dakota, 16.3 per cent; North Dakota, 15.2 per cent; Montana, 12 per cent; California, 10.3 per cent; Kansas, 9.8 per cent; Illinois, 9.3 per cent, and Iowa, 9.1 per cent.

### PHIPPS IS HUDSON SALES MANAGER

Detroit, Aug. 30—H. B. Phipps, export manager for Hudson-Essex for the past eight years, has been appointed sales manager by O. H. McCormack, general sales manager. Irving Segvalt has been appointed assistant sales manager in charge of car distribution, and O. H. Williams, export manager.

### Parker Motors Organizes in Canada With \$10,000,000

Detroit, Aug. 29—Parker Motor Car Co., Ltd., has been formed in Montreal to manufacture the Parker car, a 6-cylinder assembled vehicle, with a new adaptation of spring suspension designed by Wright-Fisher Engineering Co., this city, to meet special road conditions in Canada. The company is capitalized at \$10,000,000.

Production plans are being hurried through so that cars may be available at the time of the Montreal show. It is expected to build about 4000 cars a year and the price on the open models will not exceed \$3000. The company plans to buy at least 65 per cent of its parts in Canada.

### S. A. E. ANNUAL MEETING JAN. 10-13

New York, Aug. 30—The annual meeting of the Society of Automotive Engineers will be held in New York City Jan. 10-13, during National Automobile Show week when interest in the industry centers in the eastern metropolis. The S. A. E. dinner will be held Thursday, Jan. 12, and the carnival is set for the night preceding the dinner, Jan. 11. The meetings committee is busy arranging details for both of these events even at this early date.

The plans for the technical sessions are developing and indications point to the arrangement of a very comprehensive and educational program.

The meetings committee suggests that members desiring to present papers communicate with the society offices at 29 West 39th street, New York, without delay, since it is desirable that the acceptance of all manuscripts be decided by Oct. 1.

### Denby Stockholders Agree To Refinancing Program

**New Issue Will Bring Capital Stock  
Up to \$1,400,000; None For  
Public Sale**

DETROIT, Aug. 27—Stockholders of the Denby Motor Truck Co. agreed yesterday to the refinancing program outlined by directors, by which \$300,000 first mortgage bonds and \$650,000 first preferred stock will be issued to meet current liabilities and to provide working capital. The new stock issue will bring the company's capitalization to \$1,400,000. None of the stock will be offered at public sale.

In a statement to stockholders, 85 per cent of whom were represented at the meeting, President A. S. More said the new capital would place the company in an advantageous position to seek new business. Operations at the factory will be increased in September to meet demand for the  $\frac{3}{4}$ -ton and 1 $\frac{1}{2}$ -ton models.

The \$300,000 first mortgage bonds are five-year 7 per cent, \$100,000 Class A and \$200,000 Class B. The new stock is 8 per cent non-accumulative, par \$10. All of the new stock and bonds, except for the \$100,000 Class A bonds, will be used to meet creditors' claims, the stockholders waiving their rights to subscribe to the new issue.

### MILWAUKEE BUSINESS PROMISING

Milwaukee, Aug. 29—The activity of the automotive industries is pointed out as one of the highlights of local business, which is steadily growing better.

More confidence in the future has developed within the last 30 days. A better volume of business is being done in such lines as textiles, leather goods and automobiles, and underlying conditions promise even more. Referring to the automotive industries specifically—capacity of operations averages around 60 per cent, with one firm making automobile specialties, operating at full capacity. Automobile bodies seem to be in fair demand. The prospects for motorcycles are good. Prices in automobile lines are believed to be close to the bottom.

During August manufacturers of automotive parts and equipment have been able to make further increases in working forces in addition to the generous enlargement noted during July. At the same time the makers of passenger cars have made larger increases in schedules than in any month since April. These are based as much on orders for future delivery during fall, winter and early spring as on specifications for quick shipment.

## Small Cars to Occupy Spot At Autumn Show in France

**Foreign Makers Are Busy on New  
Models First to Appear at  
Paris Exposition**

BY W. F. BRADLEY  
*European Correspondent, Motor Age*

PARIS, Aug. 25—Sales revived during June and July in the French automobile industry, but have dropped off for August, and are not expected to pick up again until after the fall shows. All factories are working on the new or modified models which will be revealed to the public at the Paris show, scheduled for Oct. 5. Speaking generally, all firms are getting down to smaller and more economical types of cars. A few of the factories having started out after the war with medium sized cheap cars will round off their production with a high-class model; but in a greater number of cases firms having started with costly types will take up the production of cheaper and more economical cars. Among those coming into this category are Hispano-Suiza, Voisin and Delage, all of whom catered in 1920 to the luxury class only. Panhard-Levassor is expected to bring out a car with the smallest Knight engine ever built, the bore being  $2\frac{1}{2}$  in. Peugeot also has a very small rotary valve engine in preparation.

### Overhead Valve Engines Preferred

There will be a big increase at the next show in overhead valve engines, many of these having the camshaft in the base chamber, the valves being mounted in the detachable head. This design is preferred because of the cheapness of construction compared with that of the overhead camshaft. There will be an increased number of three-speed gear boxes; magneto ignition will lose a certain amount of ground, and four wheel braking systems will gain. Cyclecars are receiving a lot of attention, but the big movement will not be before next year.

Although the old prejudice against straight side tires is dying, there are no indications that continental makers will adopt these tires as standard for next year. The change, when it comes, will be gradual at first, and it is premature to expect even the beginning of it for 1922.

The Brasier factories, both in Paris and at Grenoble, have been closed, and it is doubtful if they will be reopened. This firm, which is one of the oldest in France, increased enormously in importance during the war, and had to erect a special factory at Grenoble for the production of airplane engines. Conditions have been very unsatisfactory since the armistice, and notification of the dissolving of the concern is expected daily.

Peugeot announces a considerable increase in sales during the last four months, the turnover being on a steady

ily increasing scale and the month of July breaking all records since the company existed. For the Paris district alone the sales were 3,180,000 francs for the month of July. Production at present is 700 automobiles per month, as follows: 400 10-hp. cars, 90 to 100 14-hp. models, 175 small two-seater quadrillettes, and about 30 of the 6-cylinder 25-hp. models.

(Continued on page 29)

## Packard Launches \$200,000 Drive for Fall Business

Detroit, Aug. 26—Packard Motor Car Co. has launched a \$200,000 advertising drive for fall business, through the medium of local newspapers in all sections of the country. The drive will continue for five weeks, and will be staged throughout in close cooperation with the distributor organization in each territory.

The potential fall market for cars is so large, officials said, that the company feels fully warranted in investing \$200,000 in developing it. There is no question, it is felt, but that sales of cars from Sept. 1 can be brought up to a high level by a well-planned and well-executed campaign.

Orders at the factory are showing gains. On Aug. 19 production on twin sixes was one month behind orders. Truck sales in the first 10 days of August ran 59 per cent ahead of orders for the same period in July.

Reports from territorial distributors show good business. Twin six sales in Chicago for July equalled the previous three months' business. Detroit retail sales in July ran in excess of \$250,000. Reports from New York and Philadelphia showed dealers sold out of touring cars and waiting deliveries.

### CANADA ADVANCES LABLE DATE

Ottawa, Ont., Aug. 26—The date after which all goods imported into Canada must bear the name of the country of origin, as required under the new custom regulations, has been changed from October 1 to Dec. 31, 1921, by the passage of an order-in-council.

### BUICK EQUALS SCHEDULE

Detroit, Aug. 26—Shipments of Buick cars for the first half of August reached 5,800, or approximately one-half of the 11,750 production schedule set for the month. With the fulfilling of this schedule the company will come within 250 cars of the biggest month it ever enjoyed. Present indications are that production will exceed this figure and probably set a new record. The shipments include all models, a large part being the new four-cylinder car.

### DISCONTINUE FORD INSURANCE

New York, Aug. 29—Because of the attraction of Fords for automobile thieves many of the large insurance companies issuing policies on motor cars have decided not to insure Fords among their other risks. Fluctuation in price is given as another reason for discontinuing Ford insurance.

## Law Places Ten Lamps on Connecticut Illegal List

**State Officials Issue Booklet Helpful to Users and Makers  
of Lighting Devices**

BRIDGEPORT, Conn., Aug. 27—Withdrawal of 10 headlight devices from the Connecticut approved list, under the authority granted at the last session of the legislature, has been announced by the motor vehicle department at Hartford, and through its representatives here. The devices placed under official ban by this latest ruling, effective Jan. 1, 1922, are: Ford Green Visor, Neva-blind, Nac Ne Glare Bulb, Raydex (type B), Onlec, Full Ray, Deflector, Safetee, Roadlight, Dimmre, Home-made Device. The Warner Pathfinder, Dillon (old type), Morelight, Clamert (old type) with frosted glass front and plain glass fronts with frosted bulbs, are listed as illegal devices, "which are not approved and cannot be used in this state."

Announcement is also contained in a comprehensive booklet on "Regulations Governing the Use of Headlights on Motor Vehicles," which has been prepared by the motor vehicle department for general distribution. Only advance copies have yet been given out. With certain qualifications in some cases, as to required tilting and focal adjustment, the following appear in the list of headlight devices that are approved: Patterson, Bausch-Lomb, Shaler, Wills-Sainte Claire, Legalite (new and old), Alfeco, Fractolite, Holophane, Primolite (type B), Two-Way Light Distributors, Holophane (no tilt), Lee-Knight, Benzer (types A and L), McKee (D, M and L types), Liberty (types D and L), Brown Reflector, Saferlite, Deflecting Lens, National, Universal, Violet Ray, Conaphore, Clear (type B), Bi-Optic (type F), Sun Ray (standard type), Clamert (type A), Dillon (type E), and the L types of the following: Controlite, Osgood, Superior Lens, Superfect, Parab-O-Lite, Conaphore, Clear-Old, Conaphore, Noviol-Old, Conaphore Noviol, Legalite Old, North Star Glare Shield, Raydex, Fractor.

According to the booklet, these headlight devices have met the prescribed tests of the Electrical Testing Laboratories. Announcement is also made that the National, Universal, Violet Ray, Conaphore Clear (type F), and Bi-Optic, when tilted six inches in 25 feet, will be legal in Massachusetts, as well as in Connecticut.

### CANADA LOWERS TIRE RATES

Montreal, Aug. 26—Reductions in railway freight rates on pneumatic tires and tubes have been granted by the Board of Railway Commissioners of Canada, it was stated at the transportation bureau of the Montreal Board of Trade recently, but notice has not yet been received as to the date when the reductions from second to third class will come into effect.



## Bureau of Standards Works On Lamp-Testing Apparatus

**Equipment When Completed Will  
Be Delivered to Ohio and Cali-  
fornia for Demonstrations**

WASHINGTON, Aug. 29 — Work on standardizing equipment for testing automobile headlights has been undertaken by the Bureau of Standards, Department of Commerce, here. Illuminating and electrical engineers attached to the organization have predicted that within a few weeks each city will have automobile headlight test stations, and it is for this reason that they are endeavoring to provide a standardized system. Equipment, when completed, will be delivered to the states of Ohio and California, with recommendations for specifications. These states and New York, Maryland, Connecticut, Massachusetts, Wisconsin and Pennsylvania have adopted the headlight specifications of the Illuminating Engineering Society, which are the result of much experimental work and practical experience.

The Bureau of Standards says: "The function of a headlight lens is to control the beam so that it is strong enough to light the road but not intense enough to blind the other travelers on the road. It should concentrate the light below the horizontal where the road is and where the eyes of the opposing traveler are not."

Much attention has been paid in the past to the properties of the lenses, and these are fairly well regulated, but there is lack of knowledge and control of the proper adjustment of the lenses, which the Bureau of Standards engineers believe is just as important. The suggested headlight testing stations would be educational and preventive as well as disciplinary.

"In some cases, fully approved and certified lenses have been placed in the lamps upside down and have thus thrown the glaring light in the face of approaching drivers rather than on the road," explained the Bureau of Standards engineer.

### NOMA LOWERS PRICES

New York, Aug. 29—Noma Motor Corp. announces price reductions as follows:

	Old Price	New Price
2-passenger .....	\$3000	\$2800
4-passenger .....	3200	2850
6-passenger .....	3500	3200
Sedan .....	4350	3700

No changes have been made in specifications.

### RALEIGH TO PRODUCE IN BUFFALO

New York, Aug. 29—The Raleigh Six, which has heretofore had its home in New Jersey, will shortly move to Buffalo, where a new factory is being erected for the construction of a six-cylinder car which has been in the course of development for nearly two years. The car is an assembled product, using a

six-cylinder type of Herschall Spillman engine, 3¼ by 5 in., Borg & Beck clutch, Merchant & Evans universals, Columbia axle, Gemmer steering gear and a Sharon frame. The starting and lighting are Westinghouse and ignition by Bosch magneto. One of the unusual features of this car is the fact that fuel is fed to the carburetor by a Stewart vacuum system of two-quart capacity. This is known as the industrial size, and aside from a few tractors and trucks, has not been very largely used in passenger car design. The carburetor is a Stromberg, LB2, and the gasoline tank in the rear has a capacity of 17 gallons. The wheelbase is 122 in., and the Hotchkiss drive is through semi-electric springs. The wheels are of Harvey disk manufacture.

The body is constructed by the American Body Co., and designs include five and seven-passenger touring cars, three-passenger roadster and sportabout. A sedan is later to be added. The touring car price is \$2250.

## Automotive Excise Taxes Decrease \$36,000,000 in Year

Washington, Aug. 28—Excise taxes assessed on automobiles for the fiscal year of 1921 fell off by \$23,377,031.63, according to preliminary statistics issued by the treasury department. The total yield for the past fiscal year of excise taxes on automotive equipment amounted to \$115,545,760.38. The effect of excise taxes in general was illustrated in the fact that the yield declined approximately \$36,000,000 since 1920.

## Queen City Plans Big Fall Exposition of Accessories

Cincinnati, Aug. 29—John Behle, manager of the Cincinnati Automotive Trades Assn. is planning a Fall Automotive Accessory and Equipment Exposition, to be held at Music Hall, one week in November, in which all local automotive merchants, manufacturers and allied interests are expected to participate.

In a letter recently sent to members of the association the idea of the exhibit was outlined, and returns from these letters indicate that the members are very favorable to the exhibit, which is a new idea for this city.

A similar exhibit was given last December in connection with the Ohio State Automobile Show held here. It far exceeded the expectations of those who had charge of it, and only about half as much space was provided as could have been used. The success of this venture is the foundation upon which the accessory show is being planned.

Last year the exhibit was supplied by manufacturers who were showing their products chiefly to the dealers. This year the dealers and manufacturers will show their products for the benefit of the owners. It will comprise everything in the line of accessories, equipment, supplies and repair parts.

## Automotive Industry Made Victim by Wizard French

**Rubber Company Promotion Prom-  
inent in Vast Scheme to Rob  
Public of Millions**

CHICAGO, Aug. 30—A special federal grand jury will be asked in Chicago to investigate the high finance dealings of Charles W. French. When French was arrested, it appeared that his activities had been largely in the automotive and its related field. But it later developed that the automotive industry figured more as a victim.

French's arrest has revealed two rubber companies that existed only on paper: the American Rubber Co. and the Atlantic Rubber Co. Several efforts apparently had been made to secure from Illinois towns grants of site and money for the location of the American Rubber Co., but no evidence has accumulated to show any extensive frauds on the investing public by either of these companies.

The amounts involved in the French swindles, and the amounts of the swindles for which a basis has been laid, are so extensive and so entangled that the federal district attorney in Chicago does not as yet know entirely which are principals and which are victims.

Z. W. Davis, Canton, O., has been arrested. Davis is quite a rich man and is a director of the Winton Co., Cleveland. His automotive interest has been that of an investor rather than an active worker. Nothing has developed in any way to connect French's relations with Davis and the Winton Co., and there still is doubt as to whether he is not merely a victim.

Other companies of automotive interest which are entangled in these deals are the Ideal Tire & Rubber Co., Cleveland; the Mackey Truck & Tractor Co., Akron; the Evand Motor Car Co., Akron; Midwest Auto Sales Co., Dayton, O. Several of these companies are bankrupt and their officers say one chief reason is their dealings with Davis. His plan of dealing with legitimate companies appeared to be to obtain some of their notes and then to market several times the amount of the notes entrusted to him. Davis posed as a legitimate banker with extraordinary resources for raising money on notes.

### RAIDS HEADLIGHT OFFENDERS

Sacramento, Aug. 27—Motor car dealers throughout the state are being appealed to by Charles J. Chenu, superintendent of the state motor vehicle department, to aid in the campaign to enforce the law against glaring headlights.

Superintendent Chenu is putting on raids in various parts of the state, making arrest of all violators of the motor vehicle law. In Sacramento in one night 30 such arrests were made. He believes these unannounced and spasmodic raids will bring about an observance of the law.

## BUSINESS NOTES

Lumen Bearing Co. of Buffalo and Youngstown, manufacturers of the well-known line of brass and bronze castings and bearings, solders and babbitts have located in Chicago a branch office that will supply and handle all business of the company west of and including Michigan, with the exception of Detroit, and west of a line from Toledo, to Columbus to Cincinnati; Kentucky, Tennessee and Georgia. H. S. Huncke is western sales manager.

Mt. Vernon, O.—Alleging that the Knox Tire & Rubber Co. committed an act of bankruptcy on Aug. 1 in admitting its inability to pay its obligations, four creditors of the company have entered the U. S. court, praying that the company be declared a bankrupt. The company is already in the hands of a receiver.

Indianapolis—Between 700 and 800 men will be on the payroll of the Durant Motor Co. at Muncie by Jan. 1, according to Dennis A. Burke, president and general manager of the concern, and the Muncie Durant plant will be in production before that date.

Allis-Chalmers Mfg. Co., Milwaukee, has booked a contract from the Ford Motor Co. to furnish and install four turbine type electro-generators with an aggregate output of 8000 hp., in the new tractor plant which is being established at Troy, N. Y.

Wrought Washer Mfg. Co., Milwaukee, has started work on several plant and warehouse additions. Charles H. Dirsch is secretary of the company, which supplies most of the largest users of bolts, nuts, screws and similar goods with washers.

Peter Pirsch & Co., Kenosha, Wis., manufacturers of fire-fighting equipment for mounting on horse or motor chassis, and also complete apparatus, will build plant additions of brick and steel construction.

Pelton Steel Co., Milwaukee, has disposed of its entire business to the Stowell Co. of South Milwaukee, which operates a malleable iron and malleable products plant. It is said the new owners will continue the operation of the Pelton business under its present name.

Andrew Kaul Jr. Co., Merrill, Wis., manufacturer of hubs, spokes, felloes and similar woodenware for vehicles, has completed important improvements in its plant to provide larger capacity in filling orders for makers of passenger car wheels.

A. J. Perron, president of the Perron Spark Plug Co., Sparta, Wis., has formed a new corporation to manufacture and market a vacuum traffic signal for passenger and commercial cars. It is known as the Perron Signal Co., and its officers are: president and general manager, A. J. Perron; vice-president and secretary, John W. Jones; second vice-president, M. Reisinger; treasurer, S. A. Steel.

Fischer Scrap Iron Co., Stevens Point, Wis., has changed its corporate title to F. & G. Auto Parts Co. The owners are Hyman D. Fischer and Joseph Goldstein.

Apex Spring Cover Co., Cleveland, has been chartered with a capital of \$100,000 to manufacture patented spring covers. The incorporators are H. W. P. Storer, J. C. Storer, F. A. Lennie, Carl W. Schaefer and F. A. Pagel.

Yellow Cab Manufacturing Co., Chicago, for the six months ended June 30, shows net profits after charges, but before Federal taxes, of \$527,895. This is at the rate of \$20 a share annually on the 50,000 shares of B stock, after providing 7 per cent preferred dividends on class A stock. Full capacity business is booked for the remainder of the year.

Chicago—Standard Oil Co. of Indiana, Aug. 24, announced a two-cent cut in the price of gasoline in Chicago territory bringing the price at service stations to 19 cts., and at tank stations to 17 cts. The last previous cut was made June 25 with a drop of 2 cts.

A. H. Van Auker, general manager of the Peninsular Tire & Rubber Co., Tampa, Fla., has announced that the company will shortly begin the construction here of a new \$200,000 plant. The building will be two stories in height and 100 by 300 ft. The initial capacity of the plant will be about 300 tires daily.

Buffalo—Three mechanical departments of the Pierce Arrow plant here were closed for one week beginning Aug. 15, company officials announcing this action was taken to prepare the way for the resumption of fall and winter business and to permit all pending vacations.

Southern Automotive Jobbers Assn. will hold a meeting in Memphis in November, according to tentative announcement made here.

Dallas—The outstanding obligations of the Texas Motor Car Assn., organized for the purpose of manufacturing cars, with headquarters at Fort Worth, will be paid by an assessment of 25 per cent on stockholders. The assessment will bring in approximately \$600,000. The outstanding obligations of the company total \$500,000, the receivers stated. The assessment will

leave the receivers with \$100,000 working capital.

Indianapolis—An exhibition of a new automobile to be manufactured in Mexico is being arranged for the week of the Indiana State Fair, the models being completed in the Frontenac plant here. The car is designed along the lines of the Perkun automobile, made in Warsaw, Poland, and will be made and marketed by the Compania Automobiles Anahuac de Mexico. Falomir, Mexico City; Ad P. Buquour, vice president and general manager, and J. A. Carvel, vice president and secretary, are in Indianapolis supervising completion of the models.

The plant will be located in Torreon and the officials now in Indianapolis assert that it will be in full production in six months, the first Mexican automobile plant to attempt a commercial production of motor vehicles. Buquour and Carvel assert that there is an enormous volume of business possible in Mexico and the Anahuac is designed to meet the climatic and road conditions of the country. It is a four-passenger vehicle, 115-in. wheelbase, Spanish leather upholstery, aluminum stops and interchangeable rear fenders.

Mercier Motors Co. stockholders have ratified plans for the reorganization of the company as they were outlined two weeks ago. Theodore E. A. Barthel was elected vice president and treasurer and George L. Catlin, assistant treasurer and secretary. W. A. Smith will be general sales manager. Under the reorganization Mercier will be divorced entirely from Hares Motors and will be operated as a separate entity.

Supreme Motor Corp. creditors have decided that the affairs of the company can best be conducted by the appointment of an advisory committee of creditors to act with the officers of the company. F. B. Whitlock, vice-president of the Interstate Foundry Co., Cleveland, has been appointed chairman of this committee.

Cameron Motors Corp. has taken over from Case T. Wright the plant of the Greenville Implement Co. at Greenville, Mich. Cameron Motors recently acquired the plant at Sandusky, O., of the Dauch Mfg. Co., making the Sandusky tractor.

Smithville Metal Industries, Ltd., has been formed at Niagara Falls, Ont., and will open a plant at Smithville, Ont., in which automobile accessories will be manufactured. The company has Canadian and American manufacturing rights for a number of accessories and specialties.

Signal Motor Truck Co.—Federal Judge Hale has appointed Philip G. Clifford of Portland, Ore., city receiver for the Signal Motor Truck Co., a Maine corporation, with its plant at Detroit. Judge Hale also issued a decree for the dissolution of the corporation. The company has manufactured five models of trucks ranging in capacity from one to five-ton. The capacity of the Detroit plant is 150 trucks a year.

Canadian Gary Co. has been organized at Ft. Williams, Ont., to assemble and distribute Gary trucks in Canada and British possessions. The company will take over two plants of the Canadian Steel Co. and be in production Oct. 1. Officers of the Canadian company are M. J. Neville, president, C. Tremblay, vice-president and general manager, and J. P. Kenney, secretary and treasurer. The company is capitalized at \$500,000.

Paul A. Stevenson, representative for the Oakland company in Texas, returning from a trip to Waco, Houston, Galveston and San Antonio this week, said he had closed contracts for 1922 for 674 cars worth \$700,000.

Elgin, Ill.—Ground will be broken Sept. 1 for the new plant at Elgin, Ill., of the Duty Motor Corp., which recently decided to remove from Greenville, Ill., and which manufactures motor trucks. M. L. Frank is sales manager.

Splitdorf Electrical Co. has re-established itself in the heart of New York's Automobile Row with a service branch in the Paige Building at 56th street. Charles N. Neil, is the new district manager. J. H. Dickinson is sales manager and G. M. Rymarczick service manager.

Decatur, Ill.—Creditors of the Dual Truck Tractor Co. of this city have instituted proceedings in bankruptcy. The plant has been closed.

Indianapolis—Judge Solon J. Carter of the Superior Court, this city, has been asked to appoint a receiver for the Clairmont Reynolds Body Co.

Pettijohn Automobile Co., Terre Haute, has been named distributor in that section of Indiana for the Columbia Six and the Lexington Six.

Canadian Johns-Manville Co. will erect a large manufacturing plant at Asbestos, Quebec. At the present time 89 per cent of the asbestos mined in Canada is exported to the United States.

White Motor Co., Cleveland, has declared the quarterly dividend of \$1 a share payable September 30. The White Co. has reduced bank loans \$2,500,000 since March 31.

## Motorcycle Makers Join in Lower Import Duty Plea

### American Manufacturers Invite Foreign Competition As Aid in Expense of Development

WASHINGTON, Aug. 27—Representatives of motorcycle manufacturers appeared before the Senate Finance Committee today to request a separate classification in paragraph 371 of the tariff bill, instead of classifications with bicycles, parts, etc. They also asked that the 30 per cent duty provided in the house bill on motorcycles be reduced to 15 per cent.

Walter Davidson, Milwaukee, representing the Harley-Davidson people, asked for a reduced rate, saying the object is to build up domestic production by preventing foreign makers from placing high rates against American motorcycles. He said there are scarcely any imported motorcycles for use in this country and figured that within a short time his company's exports would be two-fifths of its output.

Wm. G. McCann, Springfield, Mass., representing the Hendee Manufacturing Co., asked for reduced rates. He said England, Belgium, Australia, Spain and Italy had placed duties on motorcycles which amounted to an embargo, but Spain has lower rates, so this import market will be open to American producers. McCann said England is the only maker of motorcycles comparable in quality with American machines and that domestic makers here invite importations from Great Britain to aid in the expense of the development of the motorcycle industry. It was his contention that American motorcycle makers have succeeded in having a number of countries reduce tariffs, and expect to get further reductions from these countries and concession from countries which are now holding out.

L. B. Fauber, Elyria, O., representing the Troxel Manufacturing Co., did not approve of the reductions, but said they should not be lowered from the house rates. He declared in favor of a 45 per cent duty.

### MERCER PRICES DROP

Trenton, N. J., Aug. 26—Effective Aug. 25 a reduction of \$550 was made on all models of the Mercer car. Mercer car prices were increased last March from the prices to which they are now reduced. The old and new prices follow:

	Old	New
All open models.....	\$4500	\$3950
Limousine .....	6200	5650
Coupe .....	5700	5150

Delco-Light Co., Dayton, O., has just held a week's convention and school for district sales managers. More than 50 men were in attendance, representing 1,500 sales territories. R. E. Smithson, service manager of the company, was in charge.

Southern Motor Manufacturing Assn., Ltd., Houston, Tex., will soon place a new line of six-cylinder cars on the market. The new line will include both sport and conservative models in roadsters and touring cars.



## Trucks Given Legislative Relief in Lone Star State

### Annual License Fee Is Increased But Mileage Tax Is Eliminated; Tractors Favored

AUSTIN, Tex., Aug. 27—Motor truck dealers and operators are relieved by the passage of a bill by the legislature repealing the more objectionable features of the "motor truck law" which was enacted at the last regular session. The measure as finally amended, increases the annual license fee on commercial vehicles according to net carrying capacity and tire equipment, but the mileage tax imposed is eliminated. Trucks and tractors used exclusively for agricultural purposes are exempted from the special license fees, but it is provided that license fees shall be paid on agricultural trucks according to horse power, just as now paid by automobiles. Fees for tractors not used for agricultural purposes are based on weight.

A license shall not be issued to any truck of more than 4-ton carrying capacity, except on written application to the Highway Commission, and no license shall be issued for trucks of more than 5-ton carrying capacity.

All trucks must be equipped with rear-view mirrors and no truck shall operate with solid tires less than one inch in thickness at any point or with pneumatic tires where one of such tires is missing. Drivers operating cars in this condition are subject to penalty of not more than \$200.

Following is the scale of license fees provided for commercial motor vehicles:

Carrying capacity (pounds): 1,000 to 2,000, pneumatic tires, \$15, solid tires, \$18; 2,001 to 3,000, pneumatic tires, \$30, solid tires, \$36; 3,001 to 4,000, pneumatic tires, \$40, solid tires, \$48; 4,001 to 5,000, pneumatic tires, \$50, solid tires, \$60; 5,001 to 6,000, pneumatic tires, \$65, solid tires, \$78; 6,001 to 7,000, pneumatic, \$80, solid, \$96; 7,001 to 8,000, pneumatic, \$100, solid, \$120; 8,001 to 9,000, pneumatic, \$120, solid, \$44; 9,001 to 10,000, pneumatic, \$150, solid, \$180.

For tractors, the annual license fee shall be based upon the weight of the tractors as follows: 1 to 2,000, \$5; 2,000 to 4,000, \$10; 4,000 to 6,000, \$15; 6,000 to 8,000, \$20; 8,000 to 10,000, \$25.

### ARIZONA DEALER STRONG ON SALES

Chicago, Aug. 30—Ninety per cent of 1920 sales is not only possible, but is the actual performance of at least one dealer in Arizona, and this dealer is quite hopeful that increases over the 1920 records will make this year a better year for him than last year.

This is the record of Snow & Tufts Auto Co. of Tucson, as told by B. A. Snow to MOTOR AGE during a stopover in Chicago, when returning from Lansing to Arizona. Snow & Tufts have just been made Oldsmobile distributors for that state. This appointment will ma-

terially enlarge their sales territory as they will open another store in Phoenix to replace that of the former distributor. But it is not on this enlargement of territory that the percentage of sales for the year is based. Their record for this year has been made on the excellent standing of the Olds in this territory and that high class of service maintained in the Snow & Tufts' territory. The requirements made by the owner in this district of long distances, dust and heat, are quite severe and service must measure up to a high standard. This has been the aim of Snow & Tufts and it is to the reputation so established that they measure their success.

## Milwaukee Dealers Active In State Fair Sales Effort

Milwaukee, Wis., Aug. 29—The Milwaukee Automotive Dealers Assn. put forth an intensive selling effort at the State Fair motor show, which opened Aug. 29, with the seventy-fifth annual agricultural exposition, at West Allis, a suburb of Milwaukee. The show will close with the fair on Saturday afternoon, Sept. 3.

As in the last two years, the demands for space by dealers was so heavy that in addition to the big Motor Hall building, a temporary annex was provided to hold the overflow. The motor truck exhibits are concentrated in "Trucktown," occupying five acres of space adjoining the permanent and temporary show halls. This was the distinctly new feature of the motor show at the 1920 state fair and proved to be so successful that the idea has again been put into practice.

The show committee this year consists of Alfred Reeke, Nash and Lafayette, chairman; A. M. Jordan, Buick; W. H. Krueger, Cole and Briscoe; Melvin Newald, Stewart truck, and H. M. Glover, Jordan. Bart J. Ruddle, executive secretary and manager of the N. A. D. A., is handling the actual direction of the show. He has had charge of all Milwaukee shows since 1909.

### FORD'S BEST THREE MONTHS

Detroit, Mich., Aug. 26—Official announcement from the Ford Motor Co. today shows that during May, June and July the company turned out more cars and trucks than in any other three-month period during its history. Total production was 317,587 cars and trucks, a monthly average of 105,862.

"The exact output of the American plants for July was 107,149 cars and trucks," the announcement says.

"Foreign plants showed increasing activity in July, especially in European countries. The outlook in the automobile industry in Europe is the most encouraging it has been for six months."

### HARVEY TRUCK LOWERS PRICE

Harvey, Ill., Aug. 27—Harvey Motor Truck Co. has reduced the price on its 3½-ton truck to \$3950 and its 5-ton truck to \$4500.

## Crop Cash Stimulates Car Sales in Cleveland Field

### August in Many Instances Equals July, Which Set High Mark. Fall Promising

CLEVELAND, Aug. 30—Statements of retail automobile dealers that after-harvest sales this year exceeded those of a year ago, is borne out by conditions in industries that sell to the automobile trade.

This August, according to local leading retailers, ran far better than August, 1920. Now that the harvest is ended the farmers are commencing to receive money for their crops, and sales of automobiles are increasing in the rural sections around Cleveland.

Buying in the steel trade in the Cleveland district was better during August than it has been for many months. A large part was done by manufacturers of automobiles, and this is taken as evidence that production will increase greatly in the fall. The buying movement in the steel industry reflects the low ebb that manufacturers have let supplies reach and also shows that it is generally understood that prices have reached rock bottom. Some of the newcomers into the automobile sheet field have made concessions of several dollars a ton to get trial orders.

The Wills Sainte Claire agency here, a newcomer to automobile row, reported that August business ran close to July figures and that was a banner month. Floormen state that from 60 to 100 persons visit the salesroom daily. There is a healthy interest in this car and the management reports that sales exceed expectations.

The reduction in the price of the Hudson has greatly stimulated sales at the Stuyvesant agency—distributor of the Hudson and Essex. The price reduction sent the record for August way above the average for the month, and will also enable the company to do some nice business during the next three months.

The Dodge car is still selling at the same rate that made July and August this year the largest months in the history of the local agency, now the Barnes Motor Co. This firm sold around 250 cars in this city during August.

The Chevrolet agency, which started a whirlwind business with the last reduction in prices did not let down in August. Other agencies also report a healthy demand.

Additional evidence that business in this city is good came when directors of the White Motor Co. declared the regular quarterly dividend of \$1 a share, payable Sept. 30, to stock of Sept. 15 record. Sales of trucks, especially in July, have been of a satisfactory nature, and because of the generally improved conditions, the directors felt justified in declaring the regular dividend. It became known here that the White Co. had reduced bank loans \$2,500,000 since March 31.

## Railways Start Rate War Against Buses in Oregon

**Electric Line Cuts Fare From \$4 to  
\$1 on One Trip; Buses  
Doing Fine Business**

PORTLAND, Ore., Aug. 27—Automobile dealers of Portland, Ore., have been promised that the local electric street railway system will make no further attacks on the automobile and in no sense be a party to any campaign against the motor car, but a battle between the short haul railroads and the motor buses broke out last week with the railroads slashing the fares between the interior and the Pacific Coast resorts to a fourth of the former level. One bus line has suspended but the largest, operating a dozen big vehicles each way each day, is still running.

The first broadside from the local electric railway system was an issue of its weekly organ distributed on board all street cars and interurban trains, in which the man considering the purchase of an automobile was pointed out as someone seriously needing the attention of an alienist.

The dealers' association immediately considered retaliatory measures with its eye on the one-man street car which has become a considerable nuisance in the congested streets.

### Buses and Railroads Paralleling Each Other, in Conflict

However, it was not necessary and in the first conference with the president of the Portland Railway Light & Power Co., the dealers were promised that nothing of the character would appear in the future and that each would seek its volume of business without resorting to any attempts to throw monkeywrenches into the sales or traffic machinery of the other.

The other fight between the buses and the railroads is on the Lower Columbia Highway, the coast extension of the famous highway. The paved road and the railway, both wonderful scenic rides, parallel each other and the Columbia river from Portland to the sea. All summer long thousands journey to the seashore golf links and hotels, and until the present the buses have been enjoying a very profitable season at a rate slightly lower than that of the railway. The fare for the 120-mile ride has been around \$4.

When the railroad was cutting, it made the cut deep, and announced a fare of \$1 for the trip to Astoria and \$1.60 to the beaches. The war has been in progress now for a week, with the largest bus operating company still in operation. One company operating some beautiful new 30-passenger Pullman buses, embodying the last features of a drawing room, men's smoking room and appointments usually found only in the highest type of limousine, has quit. These bodies were built on Pierce-Arrow chassis, and the manager says he does not care to

knock them to pieces in a low-price rate war.

The Willamette valley from Portland is laced with two electric systems, the Hill lines and the Southern Pacific. Buses have also entered that field and, according to the manager of the Hill system, which owns the beach lines now in the battle, the war may be extended to that field. The rate to the Oregon capital is now nearly \$2, with the buses charging slightly less. What the outcome will be can only be guessed.

### TWO SHOWS FOR INDIANAPOLIS

Indianapolis, Aug. 29—Indianapolis is to be treated to two automobile shows this fall. The first, plans for which have been under way for weeks, will be that staged by the Indianapolis Automobile Trade Assn. the week of Sept. 5. The second will be held in conjunction with the Industrial Exposition which is to be held the week of Oct. 10. The two shows are similar in that automobiles and accessories will be shown, but they differ in that the latter exposition will be open only to Indianapolis-made products.

Requisitions for space already have been received from the automobile manufacturers here and from the tire and accessory manufacturers.

### DUESENBERG ABOUT READY

Indianapolis, Aug. 29—The Duesenberg Automobile & Motor Co., Inc., has progressed so far with its plans that it is about ready to close contracts with some distributors in metropolitan territory. The price of the Straight Eight has not yet been definitely fixed, but it is understood that it will be in the vicinity of \$6,000.

### INDIANAPOLIS PLANS FALL RACES

Indianapolis, Aug. 29—Entry blanks for the A. A. A. dirt track championship races that are to be held Saturday, Sept. 10, at the state fair ground, have been sent to Jules Ellingboe, Roscoe Sarles, Bennie Hill, Dave Koetzla, Jimmy Murphy, Joe Thomas, Eddie Hearne and other noted speedway drivers, and the management is expecting to receive signed blanks in the near future. It is the plan of the fair officials to hold a dirt track championship affair every year as part of the fair program, with the best drivers in the country competing, and they are offering inducements that should attract the best of them.

### BRAZIL ORDERS 50 TRAILERS

Detroit, Aug. 29—An order for fifty 5-ton trailers with combination steel and wood bodies has been received by the Detroit Trailer Co. from the Republic of Brazil, for instant delivery. In addition, the company has received an order for 47 bodies for G. M. C. trucks, the latter order also for the Brazilian government, being placed with General Motors, specifying Detroit bodies. The trucks and trailers are to be used for hauling cement into the interior, a distance of 250 miles.

## Miller Rubber Dividends Held for Better Business

**Company Reduces Indebtedness to  
\$2,400,000 Since Jan. 1; Pres-  
ent Production 82% of 1920**

AKRON, Aug. 27—Miller Rubber Co. officials here today announced that their preferred stock dividend due Sept. 1 would not be declared owing to a present back deficit. Owing to the uncertainty of business conditions, officials of the company also say it will be impossible to indicate when payment of dividends can be resumed, advising that this will depend entirely upon the amount of business that can be secured at prevailing prices.

Since Jan. 1 the Miller Rubber has reduced its inventory sufficiently to effect a reduction in total indebtedness from \$8,676,000 to \$2,400,000, of which \$1,400,000 is owing to banks, according to a letter just issued to stockholders. Against this the company has accounts receivable of approximately \$3,100,000, and \$1,200,000 cash in banks. Neither of the indebtedness figures accounts for commitment losses which have been reduced about \$406,000, it is stated.

During the first five months of the current year Miller business was 55 per cent of the corresponding period of last year, but since June 1 business has revived, officials claim, and now averages 82 per cent of the corresponding period of last year, at reduced prices.

"In accordance with the requirements of the preferred stock contract, the directors contemplate purchasing in the open market, so far as is deemed advisable, the amount of stock which the company is required to redeem during the current year. Funds for this purpose can be taken from the assets of the company independent of a surplus account. In fact, such action will hasten the accumulation of a surplus, from which alone dividends can be paid," states William F. Pfeiffer, secretary and treasurer of the company.

### MAXWELL ISSUES STATEMENT

Detroit, Aug. 27—The first financial statement issued by the new organization of the Maxwell Motor Corp. shows total assets of \$70,537,620.26, as of June 1. Cash in bank and receivable from the reorganization committee totals, with certificates of deposit, \$7,931,361.34. Inventory stands at \$16,166,867.05. Current assets are shown as \$28,615,098.87 as against current liabilities of \$1,855,179.98.

Commenting on the statement, President W. F. Wilson said that assets in plants and equipment have been conservatively valued and adequate depreciation maintained, and the value of inventories has also received depreciation consistent with the fall of market prices, with substantial allowance for any further loss from this or other causes.





### The Bicycle Stars of Yesteryear Line Up

The bicycle race at the Chicago Automobile Trade Assn. first annual field day and barbecue lined up the old-time professional riders who had won fame at this sport when bicycling was in its heyday

Reading from left to right: Elmer DeHaven, former bicycle rider. Si Mayer, formerly associated with James Levy. Was in the retail business until 1913. Ralph Temple, now associated with the Ambassador Automobile Co. Standing directly in back of him, and to the left of Thos. J. Hay, is Walter Githens of the Githens Bros. Financing Co., one of the oldest dealers in Chicago. Thos. J. Hay, president Chicago Automobile Trade Assn., Chandler and Cleveland dealer. Harry W. Cooper, accessory dealer. Chas. P. Root, now associated with the Chicago Motor Club. F. E. Sparks, American Chain Co. (Chicago branch). N. H. VanSicklen and H. N. Fowler, Fowler Lamp & Mach. Co.



This shows the start of the men's shoe race—taking off and putting on—25 yds.

### Chicago Auto Trade Picnic Brings Dealers Together

#### Big Outing First of Annual Events to Mark New Activities in Association

CHICAGO, Aug. 29—The First Annual Field Day and Barbecue of the Chicago Automobile Trade Assn. was an artistic and gastronomic success. More than 300 dealers and members of their sales staffs were present. The site was in a woodland 35 miles from the Loop district, and by previously well laid plans the entire run was made with only one stop.

The day was devoted to informal sports, the events being so selected that almost every dealer could find a place for himself, regardless of age, weight

or the kind of clothing he favored. Nearly everything was on the card except golf. However, some of the chief attractions were never put on the card at all.

The chief single interest of the day was Tom Hay's personally conducted baseball game. He was on the diamond only as umpire, but he took charge of the entire event and even when he traded places with the pitchers of each team, managed to ward off all outside interference.

Running a close second to the ball game was the bicycle race by old-time professional riders who are at present in the automobile industry. At least one of these men had not ridden a bicycle since the days when he performed on a high wheeler. The racers, in the order of finish, were:

Harry Cooper, James Levy, Thomas J. Hay, N. H. Van Sickle, Ralph Temple, Si Meyer and Charles P. Root.

### Detroit Trailer Co. Builds 50-Ton, 8-Wheel Semi-Trailer

#### Four - Wheel - in - Line Construction Disposes of Overloading Legislative Difficulty

DETROIT, Aug. 28—The Detroit Trailer Co. has brought out a heavy duty, semi-trailer, capable of carrying a load of 50 tons, which it is now preparing to place in production. The semi-trailer was given a thorough trial last week and found fully practicable for the work designed. Several orders for first production were placed following the trial.

The semi-trailer departs from the conventional in that it has four wheels in line instead of two. This gives it a total tire surface of 48 in. and permits a load disposition of about 800 lbs. per sq. in. Each of the four wheels are mounted on special Mansfield axles with radius rods on ball joints. Double spring action is provided.

Specifications of the semi-trailer in addition to Mansfield axles and steel frames, call for Timken bearings and Detroit springs. List price has been fixed at \$2750 and the company regards the field for the new vehicle as unlimited. Through the use of the eight wheels to carry the load, the trailer overcomes overloading legislation.

The new trailer was designed by J. B. Mansfield, president of the company, and patents covering all features have been applied for.

### Tank Gasoline Is Cheaper and Better Than in 1920

New York, Aug. 27—The fourth semi-annual motor gasoline survey, conducted by the United States Geological Survey during the month of July, shows an interesting relation between the market price and the quality of motor gasoline. This is particularly evident if figures obtained are compared with those of a year ago. At the time the Bureau of Mines conducted its summer survey of motor gasoline last year the average tank wagon price of gasoline was 28.2 cents per gallon. This year it was 21.2 cents, a drop of practically 25 per cent.

The nine cities in which samples of gasoline were collected this summer and the tank wagon prices are as follows:

City—	—July—		Differ-
	1920	1921	ence
New York, N. Y.....	30.0	24.0	6.0
Washington, D. C.....	28.5	22.0	6.5
Pittsburgh, Pa. ....	29.7	22.0	7.7
Chicago, Ill. ....	26.0	18.0	8.0
New Orleans, La.....	28.0	17.5	10.5
St. Louis, Mo.....	25.7	17.4	8.3
Denver, Col.....	31.0	22.0	9.0
Salt Lake City, Utah....	31.5	25.0	6.5
San Francisco, Calif.....	23.5	23.0	0.5
Average .....	28.2	21.2	7.0

In spite of this drop in price the quality of gasoline is much better than it was last summer; in fact, the average gasoline is almost identical in quality with the average gasoline sold last winter.

## IN THE RETAIL FIELD

**Logansport**—Charges of grand larceny are contained in affidavits filed in municipal court against Newton VanZandt, former president of the Revere Motor Corp. The charge was filed by J. B. Porter, Buffalo broker who recently appealed for a court order for an accounting by officers of the Revere company. Porter avers he bought \$4500 worth of Revere stock from VanZandt.

**Dallas**—Managers of the Dallas Automobile Trades Assn. have decided to hold the fall automobile show during the State Fair of Texas at the fair grounds here.

**Dallas**—The garage of the Balmorhea Auto Co. of Balmorhea, Tex., and the accessory business of Perry Wagnuh were destroyed by fire this week. The loss was about \$20,000.

**Dallas**—A reorganization of the Cox Motor Sales Co., distributors for the Haynes car in north Texas, is under way. The capital stock will be increased from \$75,000 to \$125,000, according to Homer J. Cox, president.

**Dallas**—A. E. Braden, formerly of Cleveland, later of Shreveport, La., has been added to the forces of the S. G. Davis Motor Co., distributors for the Oldsmobile in this section. Braden will have charge of the east Texas territory and will immediately begin to build up agencies.

The committee on arrangements for the show this fall consists of F. E. McLarty, chairman, and W. G. Langley, P. D. Winnings, George H. Gaston, R. J. Jackson, M. B. Sterrett and David F. Burke.

**Cleveland**—Two hundred and fifty Cleveland tire dealers went to Akron last week for their annual outing at the "tire capital" of America. After a program of field sports they made an inspection of the Goodyear factory and watched tires being built.

**Simmons Motor Truck Co.**, Des Moines, is the new firm name of the reorganized Consigny Motor Truck Co. William Gibson is head of the new firm.

**Duffield Motor Co.**, Des Moines, is the name of the new Ford agency here. This is the third sales agency to be granted a franchise in this city.

**Weatherall & Sehler**, Grand Rapids, have been named distributors for western Michigan of Columbia cars. The firm is composed of R. J. Weatherall and Roland Sehler. R. C. Velten, Jr., has been appointed sales manager.

**C. G. Lewis**, Tacoma, Pacific coast service manager for the Hudson Motor Car Co., who has received first-hand information at many points in the northwest and California, says conditions in the automobile trade along the coast give every appearance of decided improvement at the end of August.

**Otto J. Dohlen and Clifford Hosking**, Rockford, Ill., have purchased the W. P. Bennethum automobile service and accessory business and will conduct the business, specializing in tires and vulcanizing.

**Jess Imbler**, Kokomo, Ind., has opened an automobile salesroom at Tipton, Ind. He has the agency for the Auburn cars.

**R. K. Wysong**, Michigan City, Ind., has been named state agent for the National Tire Stores, Inc., a Delaware corporation, which is qualified to do business in Indiana. The company deals in rubber tires and automobile accessories.

**J. M. Schaab**, Rock Island, Ill., will build a garage 62 by 150 ft., which will cost \$25,000. The structure will be two stories and fireproof.

**Bridgeport, Conn.**—Organization of the Morrissey Motor Car Co. and its acquisition of the Reo agency for this territory has been announced. The firm is composed of Thomas Morrissey, Walter C. Anderson and Charles J. Haynes, all well known in the local automotive world.

**Indianapolis**—Following closely on the heels of the information that Coffin & Brown had closed for a distribution contract of the Wills Saint Claire in Indiana, is the announcement that the Stutz, which has been marketed by Coffin & Brown for several years, will again be handled in Indiana by a retail organization at the factory. Ray Brown plans for an opening display of the new line Aug. 29.

The Oldsmobile line, relinquished, recently by The Wildhack Co., which took over the Reo, has not been definitely placed. It is understood that several well-organized companies seek the contract.

**Indianapolis**—Information received from the family of H. V. Lathrop, who recently went to San Francisco with the intention of a permanent residence on the coast, is that Mr. Lathrop will return to Indianapolis Sept. 1. No change has been made in the Lathrop-McFarland Co. distributors of Cole cars and it is assumed that Mr. Lathrop will return to active management of that business.

**Thayer Morrow**, Bloomington, Ill., distributor of the Ford car and Fordson tractor in the central Illinois territory, has retired to engage in the automotive business elsewhere, his plans being withheld for a short time. He succeeded Dayton Keith when the latter moved to Chicago to become distributor for the Wills Sainte Claire car. The successor of Morrow will be announced within the near future.

**Howell-Swift Tire Co.**, Portland, Ore., has been appointed distributor for Savage tires in western Oregon and the Columbia river counties in Washington. The announcement was made by A. C. Lester of Los Angeles, Pacific coast district manager for the Spreckles Tire Co., which has its factory at San Diego.

**Russell H. Lawson Auto Co.**, Portland, Ore., was recently named distributor for this section for the Columbia Six by the Columbia Motor Car Co., Detroit.

**Newark, N. J.**—Dealers handling the Kelsey Six friction-drive held a two-day convention and outing here Aug. 15 and 16.

**Deming-Todd Motor Co.**, Columbus, O., has taken the central Ohio distributing agency for the Wills Sainte Claire. Grant W. Deming is president and Charles B. Todd, secretary-treasurer.

**C. H. Forman Motor Sales Co.**, Columbus, O., has purchased the assets of the Columbus Armleder Co. The company will distribute the Armleder, Stewart and Day-Elder lines of motor trucks.

**A. E. Lundell Auto Co.** of Houston, Tex., has been appointed distributor for the Lexington cars in south Texas. Agents for the Lexington will be established in many south Texas cities immediately.

**John Conner**, Hamburg, Ia., has purchased the automobile accessory stock of the Bradley Motor Co., Decatur, Ill.

**Hilmer Motor Co.** has been organized at Springfield, Ill., and will distribute Briscoe cars in the Sangamon county territory. J. E. Hilmer is president of the new company.

**Laster Reo Co.**, Des Moines, a new firm, has taken over the agency for Reo covering 20 counties in central Iowa.

**J. C. Gentry**, Sheffield, Ill., who has been conducting an automobile repairshop, has filed a petition in bankruptcy. There are claims of \$6,000 and assets of two-thirds of that sum.

**Charles C. Fagan Co.**, distributor of Pierce Arrow automobiles throughout the Portland, Ore. territory, has been appointed representative for the new Wills Sainte Claire. The Portland concern will cover Oregon and the southern part of Washington for the car.

**Coffin-Brown Co.** has been selected Wills-Sainte Claire distributor for Indianapolis and territory.

## Automotive Industry Moves Forward Through July Slack

### Parts Makers Place Constructive Outlook on Conditions and Eliminate Alarm and Pessimism

**NEW YORK, Aug. 24**—During July the automotive industry not only held its own in the face of the normal seasonal slump but actually moved forward. The basic betterment of underlying conditions, as revealed by a searching analysis of current financial and commercial factors, gives promise for continued improvement, which should be more marked in September and October.

This is the significant feature of the regular monthly surveys made public today by the Motor and Accessory Mfrs. Assn.

The concentrated experience and precise financial reports of more than 300 representative manufacturers of units and equipment for passenger automobiles and motor trucks form the basis for the association's statistical charts.

Purchases of parts, units and accessories by the vehicle builders increased 1 1/4 per cent during July over June. Further encouragement was seen in the fact that the totals of notes outstanding decreased almost 8 per cent. The only unfavorable factor indicated by the month's figures was an increase of 10 per cent in the totals of past due accounts reported.

The month-by-month percentage changes, beginning last January, follow:

Month—	Per Cent Change*	Per Cent Change**	Per Cent Change***
January .....			
February .....	66.15 Inc.	17.07 Dec.	39.08 Inc.
March .....	93.30 Inc.	16.57 Dec.	16.38 Dec.
April .....	32.93 Inc.	4.49 Dec.	5.94 Inc.
May .....	00.13 Inc.	15.64 Dec.	16.77 Dec.
June .....	15.19 Dec.	4.79 Inc.	10.37 Dec.
July .....	1.68 Inc.	10.79 Inc.	7.90 Dec.

\*Purchases of parts, units, equipment, etc., by automobile passenger car and motor truck makers from 300 parts and accessory manufacturers, by months—per cent change.

\*\*Totals of past due accounts reported—per cent change.

\*\*\*Totals of notes outstanding—per cent change.

Credit managers and general executives of parts-manufacturing concerns are now inclined to take a more optimistic view of the present situation and immediate prospects, and they point to release on deferred shipments, new orders, and better collections to justify their constructive outlook. The vague feeling of alarm and discouragement which was evident in some circles several months ago has been largely eliminated.

"We are too busy making business to have time for the blues," remarked one official in touch with many of the largest concerns in the industry.

**Portland**—Automobile men of Portland and their families gathered at Columbia beach, a local beach resort, last week for the big annual picnic of the Portland Automotive Trades Assn.

## TO MAKE I. H. C. TRUCKS IN CANADA

**Hamilton, Ont., Aug. 20**—The International Harvester Co. of Canada, Ltd., is to equip its Chatham works to manufacture International motor trucks. The first size to go into immediate production will be the model "S" speed truck.

These trucks have heretofore been made in the United States, but the vol-

ume of business has grown so rapidly that business judgment dictated some centrally located Canadian city as the manufacturing base. Chatham was selected because it is the home of the large wagon and sleigh factory of the Harvester company, where McCormick, Deering and Chatham wagons and sleighs have been built for many years.



## Small Cars to Occupy Spot at Autumn Show in France

### Foreign Makers Are Busy on New Models First to Appear at Paris Exposition

(Continued from page 22)

There is a growing demand for the cheap quadrilette, and arrangements are in hand for an increase of this model to 600 per month. Peugeot is building 250 motorcycles and 9000 bicycles per month. In the experimental department work is being completed on a 50-hp. two-cylinder two-stroke engine which will run on any fuel, from high-grade gasoline to crude oil, and will start up as quickly on heavy as on light fuel. This engine is at present being used for stationary work, but it is intended later to fit it into a 5-ton chassis.

Renault, in addition to passenger car production, is devoting a lot of attention to stationary engines and factory equipment. Among the new productions is a 10-hp. stationary engine running on either gasoline or kerosene, entirely enclosed for service in factories and workshops containing inflammable material, such as sawmills and wood working shops. A marine type heavy oil semi-Diesel 40-hp. engine is also in production, as well as a horizontal 80-hp. semi-Diesel. Renault is also devoting attention to small house lighting sets, the electric part of these being furnished by the S. E. V. Co., in which he holds important interests.

### Devoting Attention to Repair of Locomotives

The Gobron Co., which has been dormant since the war, will shortly come on the market with a high grade 6-cylinder valveless type. Berliet, while continuing passenger car and truck production, is devoting more and more attention to the repair of locomotives and the building of light railroad material.

The Salmson Aviation Co. is expected to come on the market this year with its own type of four-cylinder cyclecar. This firm is at present building the G. N., a machine of English design, with twin-cylinder engine and transmission by chains and dog clutches. The company is still devoting attention to airplanes and airplane engines.

Ballot, who up to the present has devoted himself to engines, announces that he is putting into production a series of 100 chassis, exact duplicates of the 122 cu. in., four-cylinder car, with which Goux won third place at an average of 72 miles an hour in the recent French Grand Prix. This car is a four-cylinder of 3 x 5.2 in. bore and stroke, of the same general design as the eight-cylinder models seen at Indianapolis, and is fitted with front wheel brakes. Deliveries will begin in November.

Bugatti is working on a high grade overhead valve eight-cylinder-in-line car, which probably will be out in time for the shows. An eight-cylinder-in-line is

also in production at the Cottin-Desgouttes factory at Lyons.

Bayard-Clement and Lorraine-Dietrich, two firms which united forces about a year ago, have recently separated and are working independently. Lorraine-Dietrich is under the technical management of Engineer Barbarou, who has produced a six-cylinder overhead valve car of high quality, but designed with cheap production in view. In addition, the firm is producing a limited number of two types of high grade costly cars.

### STEVENS-DURYEA LOWERS PRICE

Springfield, Mass., Aug. 27—Stevens-Duryea has reduced the price of its seven-passenger touring car to \$6800; its vestibule limousine to \$8600; four-passenger touring to \$6900, and chassis to \$5600, effective Sept. 1.

### OVERLAND MOVES ENGINEERS

Toledo, Aug. 26—In the shift of the engineering department of the Willys-Overland plant at Elyria to Toledo is seen a move to manage the Elyria property directly from this city. The officials denied that there was any plan to sell the Elyria plant. The Willys-Knight engines have been manufactured and assembled at that point. Their manufacture will be continued there, it was announced.

In the change, J. H. Edwards, manager and engineer at the Elyria factory, has tendered his resignation, effective Nov. 1, and his staff of engineers will come directly under the control of E. H. Belden, chief engineer at Toledo.

Production at the local plant has been gradually reduced in the last few weeks and short week shifts are being worked. The Doehler Die Castings Co. also has laid off a large number of men in curtailing output for this fall.

### STUDEBAKERS POPULAR IN GOTHAM

New York, Aug. 22—The New York branch of the Studebaker Corp. reports that this month probably will be the best August in its history, although comparison with previous months indicates that the company is feeling some of the effects of seasonal dullness in automobile buying.

The best month the New York branch ever enjoyed was last June, when 451 vehicles were sold. July deliveries were 328 cars and indications are that August sales will run about 90 per cent of July, or something like 300 machines.

There is an unusually heavy demand for Studebaker enclosed cars in the Metropolitan district and some business is being lost every day because of inability to make immediate deliveries.

### GEORGIA TAXES GASOLINE

Atlanta, Aug. 29—Contrary to expectations the gasoline tax bill in Georgia has been reconsidered and was passed by the state legislature now in session, providing a tax of one cent per gallon on gasoline. The tax is placed, however, on the wholesaler instead of the retailer.

## Creditor Committee Takes Charge of Ogren Affairs

### Reorganization of Company Said to Be Under Consideration; Assets Exceed Liabilities

MILWAUKEE, Aug. 29—A creditors' committee has been appointed to take charge of the affairs of the Ogren Motor Car Co., Milwaukee, manufacturing the Ogren Six. Members of the committee are: John D. Babcock, president Auto Supply Co.; John S. Blakney, of Shadbolt & Boyd Iron Co.; Thomas I. Kidd, manager Brunswick-Balke-Collender Co.; Gerhardt E. Bellack, credit manager Philip Gross Hardware Co., all of Milwaukee, and C. F. Brandt, general manager Racine Mfg. Co., Racine, Wis.

Liabilities of \$125,000 are admitted, and assets of \$150,000 are claimed in an informal statement to the committee by Clarence J. Richards, attorney for the company. The assets are composed of book values and include real estate and buildings used as a plant, which is partly encumbered.

Creditors said it is believed likely that a reorganization can be effected so that the business may be continued. It is reported that a western capitalist is interested in the negotiations and may provide adequate financial support for a reorganization, but his identity is withheld.

The Ogren company is incorporated under the laws of Wisconsin, with an authorized capitalization of \$500,000. Hugo W. Ogren, formerly prominent as a racing pilot, is at the head of the company and is its chief engineer. One of the principal backers of the concern since it was established in Milwaukee about two years ago out of a nucleus originally founded at Chicago by Ogren, is Fred G. Smith, proprietor of the big recreation center in the Plankinton Arcade, Milwaukee.

Apart from the action of creditors, the Beaver Mfg. Co., Milwaukee, has brought suit against the Ogren company to recover \$15,000 on a contract for engines. Fred G. Smith is made a party defendant in the sum of \$11,000, representing notes which he endorsed personally, according to the complaint. The Ogren company contends that the engines furnished by the Beaver company were not satisfactory and it was necessary to purchase other engines elsewhere.

### TO MAKE EUGOL SPEED TRUCK

Chicago, Aug. 30—The Eugol Motor Truck Co., formed by Eugene Goldman, formerly connected with Master Trucks, Inc., has established offices in this city and has a factory in Kenosha, Wis., for the manufacture of a speed truck which will be assembled largely of standard units. Production is already under way and the factory is being enlarged for body storage and painting.

## Concerning Men You Know

E. G. Wilmer, president of the Goodyear Tire & Rubber Co., left Akron last week for his first "swing around the Goodyear circle." Accompanied by P. W. Litchfield, vice-president and factory manager, he will visit the branch factories in Toronto, Canada and Los Angeles, and the company's cotton plantation near Phoenix, Ariz. L. C. Rockhill, general sales manager, and W. S. Wolfe, in charge of experimental and development work, will join the party at Los Angeles.

Francis W. Davis has been named engineering executive of the truck section of the Pierce-Arrow company.

E. C. Bennett has been given charge of the accessory department of the Sunset Motor Co., Tacoma, Wash.

Timothy J. Dailey, Batavia, N. Y., has been elected treasurer of the Adria Motor Corp., which has taken over the plant of the Gray Machine Tool Co. at Batavia. The production of Adria cars is soon to begin, according to a statement by company officials.

Charles B. Tamm, former purchasing agent of the Le Roi Co., builders of Little Giant motors, has resigned to accept the position of assistant general manager of the Hydro Hoist Co., Milwaukee. The Hydro Hoist Co. is a subsidiary company of the Heil Co.

William Bennett, with headquarters in Chicago, has taken charge of sales in the United States for the Hodge Chain Co., Hammond, Ind.

R. S. Abbott, formerly of Atlanta, where he was with the Ford branch, has been made manager of the Ford branch at Houston, Tex. Claude M. Alexander, assistant manager of the Ford branch at Houston, has been made manager of the Ford branch at Memphis, Tenn. Both men have assumed duties at their new stations.

John Lockwood, identified with development of wood and metal work in the automobile body, died recently at his home in Merrimac, Mass. For more than 27 years he had been foreman at the Currier Cameron Co.'s plant at Amesbury, a concern of wide reputation as the builder of motor vehicle bodies.

E. W. Seaholm has been appointed chief engineer, in charge of the engineering activities of the Cadillac Motor Car Co.

Maxwell Motor Corp. has elected B. E. Hutchinson treasurer.

Ralph L. Ross, for two years general superintendent of the Moreland Truck Co., Los Angeles, and formerly connected with the Continentals Motor Corp. at Detroit and Muskegon and superintendent of the Beaver State Motor Co., Portland, Ore., has become connected with the Leach-Biltwell Motor Car Co., Los Angeles, and has charge of the motor department, production end, of the Leach factory.

Motor Wheel Corp., Lansing, Mich., has organized a steel wheel division, of which Roy F. Irvin has been made sales manager, in addition to his duties as head of the advertising department.

ing schedule at the local plant, he replied that he did not believe it would. He explained that from the present outlook the larger part of the contract will be handled at the corporation's Cambridge, Mass., plant. An unconfirmed report from Boston is to the effect that the contract in question involves about \$3,500,000, and is from the manufacturers of the Hudson and Essex automobiles.

### "Best Year in Last Two" Say Indianapolis Dealers

Indianapolis, Aug. 30—Throughout July the retail automobile merchants reported steady increases in volume of automobile sales; the Indianapolis branch of Nordyke & Marmon recorded the largest business in its history. Indianapolis distributors generally reported that out-state business was better than had been recorded in two years.

The Malleable Iron Co., a new organization in a new plant in Kokomo, opens next week to supply the Haynes Automobile Co. and the Service Motor Co. of Wabash. The opening of this plant provides employment for 500 men. The Haynes company will average full normal production this month, although at times it has exceeded normal production. The Kokomo Rubber Works has been busy and other automotive plants in northern Indiana are getting back to nearly capacity operations.

In the southern part of the state motor car and motor vehicle body manufacturers report very satisfactory increases in business. The Lafayette Motor Co. is making five cars a day. Stutz has resumed on a small scale and

the Nordyke & Marmon Co. is operating to near capacity.

General conditions in the state are encouraging, the building trades showing much activity. Crops have been fairly good.

### MEYERS SPARK PLUG TO MOVE

Detroit, Aug. 27—The plant of the Meyers Spark Plug Co. will be moved from Toledo to this city, following arrangements for the financing of the new Detroit Ignition Co., which has taken over the Meyers Co. The new company will have a capitalization of \$300,000, part of this having been paid over to stockholders in the original company.

### TRUSTS 'EM TO \$50

Hartford, Conn., Aug. 27—There is now in existence in Connecticut a law which compels a repairman or mechanic or garage or service station to obtain from a car owner a written authorization before proceeding with the work on his car, if that work is to cost more than \$50. In other words, the man who overhauls a car or does work on it that he says will cost less than \$50 and then tells the owner that the charges are in excess of this amount, is guilty of a violation punishable by fine and imprisonment.

### PRESTON HAS FIVE NEW MODELS

Birmingham, Aug. 26—The Preston Motors Corp. has announced five models for production at its plant at Birmingham, to commence in September. These will all be built on the standard chassis used by this company on its touring car which has been on the market for several years.

A roadster was brought out by the company a month ago. It now plans to bring out a closed car, a sedan and a coupe, all to be manufactured at the Birmingham plants. The additional new models will be on the market on or about Sept. 1.

Prices or exact specifications have not been made public for the new models, but these will be along the general lines established by the company on their touring car and roadster.

### NEW ENGINE WEIGHS 46 POUNDS

Milwaukee, Aug. 29—Ole Evinrude, inventor and designer of the outboard gas engine for application to rowboats and canoes, has perfected an advanced type of engine in the form of a twin-cylinder weighing only 46 lbs., and developing 3 hp., which he has put into production on a quantity basis. Mr. Evinrude has created a new organization under the name of Elto Outboard Motor Co., Milwaukee.

Indianapolis—Directors of the Indiana Automotive Trade Assn. will meet Thursday, Sept. 8, to fix dates for the 1921 convention and a quantity of routine business. The convention will be in November or December. Rearrangement of the present plan of districting the state probably will be discussed by the directors with the purpose of arriving at a plan that will be placed before the convention for approval prior to the election of officers.

### Bankers' Rules to Govern Car Sales in Louisiana

New Orleans, Aug. 30—Business conditions in Louisiana this fall will show an improvement over the first nine months of the year, although sales are not expected to reach the volume of last fall. The general impression seems to be that farmers in this section will be required to liquidate their bank indebtedness to such an extent that they will have little money with which to purchase automotive equipment. The country banker probably will assist worthy dealers in clearing actual sales, although discouraging the dealers from stocking excess vehicles. These bankers will handle some deferred payment paper, but it will be more closely scrutinized than ever before and they will have to be assured that the purchaser is financially responsible. They also will require larger cash payments.

General business conditions show a slight improvement, and inventories are gradually being worked down. Merchants are taking their losses and cutting expenses. There is confidence that better times are coming, but the process of readjustment is slow.

### BOSCH TO EXTEND FIELD

Springfield, Mass., Aug. 29—Reports for sometime current that the American Bosch Magneto Co. of this city has closed a deal for production of automobile lighting and starting systems has been confirmed by President Arthur T. Murray at his office here. However, he said that he is unprepared to give out details.

In reply to a question as to whether the contract will mean a longer work-



# Automotive Architecture

## Planning & Building Problems

Conducted by Tom Wilder

### Corner Garage and Filling Station

**Q**—As we are planning to erect a building for a garage in a small country town and are somewhat puzzled as to how to arrange the floor plan so as to give the best results, we would appreciate your advice.

The building is to be of cement block and there is to be a skylight over the total length of the building. It is to be about 40 by 70 ft., unless you advise wider or longer, as the lot is plenty large.

This lot is on a corner and the building is to face north. An office, stockroom and repairshop must be provided for, but there will be no storage except for cars in repair and our own. We have been planning to cut off the northeast corner and have our office and show window here. This would provide a nice place to dispense gasoline in front. We would like your advice on this.—John Van Rhee, Zeeland, Mich.

Unless you have considerably more space to spare than indicated on your sketch, it would be much better to use a curb pump for gasoline than to try to build a drive-in station on such a small scale. The principal need for a drive-in station comes when traffic is so heavy on a street that conjection is caused by cars stopping at the curb. Large cities pass ordinances prohibiting the curb pump, and here the drive-in station is a necessity. In a small town, however, one cannot hope to get in the drive-in station class by cutting off a small corner of his building, as a regular drive-in station usually requires a space 50 ft. square.

We would suggest that you make your building 50 ft. instead of 40 ft. wide, so that if later you wish to lengthen it, the space would be more suitable for storage or general garage purposes. Forty ft. is a suitable width for Fords, but will not accommodate larger cars without a lot of trouble.

The front entrance should also be eliminated, as one entrance is plenty and this space might later work into a showroom for either new or used cars.

We would like a small office and a showroom that will hold about two cars, one truck, and one tractor. We expect to carry about a \$2,000 stock of tires and about the same amount of accessories, including \$500 worth of Ford parts. Would like room in front for the above-mentioned things, and for three 8-ft. show-cases and a ladies' restroom. Would you suggest making the front of solid plate glass?

We never intend stocking more than six cars, three trucks and about three tractors, so we don't think that the room for stock cars should be so large.

In our workshop we have 20 ft. of line shaft, 14 ft. of jack shaft, which runs lathe, burning-in stand, large drill press, emery H wheel, air compressor, 7-ft. lathe weaver, 20-ton press, welding tanks and table. Would you advise pits for working under cars?

We have tried to explain what we have in order that you may better determine the arrangements in a new building. We would be glad to have you draw us a diagram of the building showing the location of each piece of machinery as well as of the building itself.

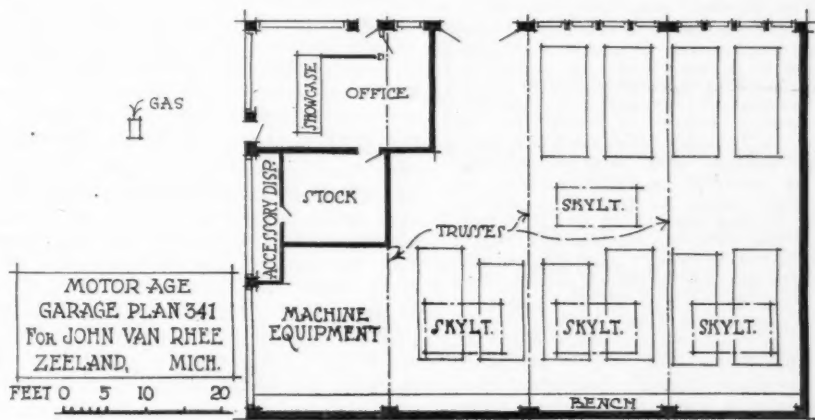
We will have no battery department just at this time. We would like to begin

work on this in August.—Ferriday Auto Co., Ferriday, La.

Drive-in filling stations cutting off the corner of a building are undesirable because they make inside arrangements difficult. By setting the whole structure back to gain 20 ft. in front, a double passage station with two pumps accommodating four cars is obtained. It has also seemed advisable to use all the depth of the lot, adding 10 ft. to the length of the building.

Your showroom is barely large enough to hold the cars you wish it to hold and the new car storage space would be packed so tight that it really should be a few feet wider. The only department where a 10-ft. cut could be made is the shop. This, however, also seems unwise.

Air and water had better be at the curb in front of the filling station or on the side street, so that customers getting air will not be in the way of gasoline customers.



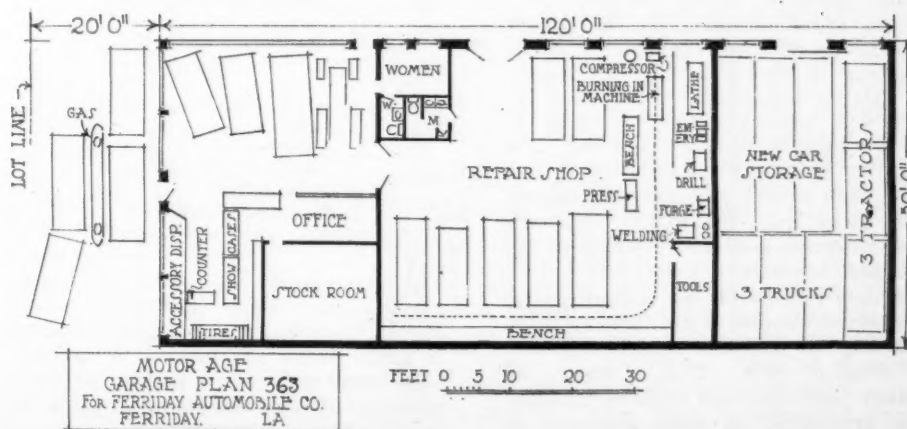
Plan 361. Garage and repairshop suitable for a corner location

### Addition of 10 Feet Advisable

PLAN No. 363

**Q**—We are going to build a brick garage 50 x 110 ft. and would like to have you draw us a plan of the way you would advise the building's being built, showing the location of machinery, air station and filling station.

Our lot is on the corner of a main gravel road, in fact two main roads of the parish come together right at our lot. We own 150 ft. frontage by 140 ft. deep and have gravel road in front and on the side of the lot. We will have a filling station, and would prefer a drive-in station if possible to have one in front of our garage. Please advise how you would arrange this station, air hose, and water hose, air and grease.



Plan 363—Suitable for a garage, showroom, office and repairshop

# The Readers' Clearing House

## Questions & Answers

CONDUCTED BY WM. H. HUNT

### Static and Dynamic Balancing of Crankshafts

**Q**—INSTRUCT how to balance perfectly a Ford Motor, including the balancing of the crankshaft with "Dunn Counter-balances," balancing of pistons, connecting rods, etc. Does it require special balancing machinery to do a perfect job?

2—Are the counterweights on Hudson and Essex crankshafts designed to balance the crankshaft or the reciprocating parts, or both; if they are designed to balance the crankshaft then have they any effect upon the reciprocating parts?

3—Can a crankshaft be perfectly balanced within itself or, in other words, without using counterweights? Some manufacturers not using them claim their engines to be perfectly balanced and vibrationless throughout their speed range. If this is a fact, why do some manufacturers make a practice of using them? On the other hand, if counterweighting is necessary to obtain perfect balance and extremely good results, why do not all manufacturers do it? It seems to us that most engines having counterbalanced crankshafts turn to a higher crankshaft speed.

4—Has a gas engine as much power at low and moderate speeds with wide open throttle as at near maximum speed?

5—Is there any way to figure the possible performance of a motor car? We have tried it in this way: we multiplied the horsepower of the motor by the number of crankshaft revolutions made per mile, which, of course, is determined by the gear ratio and tire circumference. We then divided that product by the weight of the car, and the number so arrived was taken as the performance. However, we did not know what to consider as the correct horsepower when figuring, for the reason that an engine will not develop its maximum horsepower at the ordinary driving speed.

6—Give the name of the best book you know of on carburetion; also name of author and name and address of publisher. Alvin Steinberg, Tilleda, Wis.

1—Effecting a static balance is a comparatively simple matter and may be accomplished by means of the simple apparatus shown in Fig. 1. Or an even simpler balancing device consists of two straight edges arranged at the proper distance apart. An example of static balancing is shown in Fig. 2. Herein the weights are exactly equal and the shaft will remain in any position to which it may be turned. However, it is plain that if the shaft is revolved at high speed, each weight will have a tendency to fly away from the shaft. This will cause vibration and severe strain to the shaft and bearings.

The only remedy for the condition is to apply equal weights to the opposite sides, as nearly as possible directly opposite the original ones. This is known as dynamic balancing and requires an elaborate apparatus. A close approach to a dynamic balance can be made by sus-

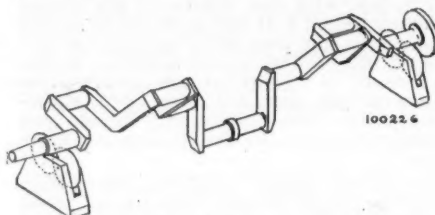


Fig. No. 1—Knife edge apparatus used to balance rotating parts statically

pending the shaft by a cord attached to the exact center of one end.

A shaft which is truly balanced will rotate at considerable speed without wobbling, while a poorly balanced one will begin to whip after a few revolutions, the ends describing circles about a line at an angle to the shaft center. This is illustrated in Fig. 3. The counterbalances mentioned are designed to balance both the shaft and the crank pins ends of the connecting rods.

The upper ends of the rods and the pistons balance each other dynamically as long as they are of the same weight. To obtain a perfect balance, each piston and rod assembly should be weighed by the method shown in Fig. 2. Obviously each of the assemblies should be placed on the scale in exactly the same position by placing them on a scale in such a way that the piston and the upper half of the rod rest on the scale platform with the lower end of the rod supported at a level equal to half the piston diameter above the platform. After the pistons have been balanced up the rods are reversed and the lower end, including the cap, balanced in the same way.

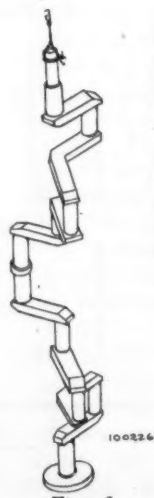


Fig. 3

Fig. No. 2—This shaft, although statically balanced, is badly out of balance dynamically

Fig. No. 3—A simple, though not absolutely accurate method of testing a crankshaft for dynamic balance

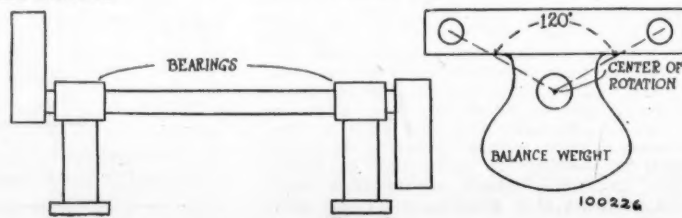


Fig. 2

2—This question is partially answered in the foregoing paragraphs. The crank pin ends and about half of the connecting rod shank may be considered as rotating rather than reciprocating parts, and are balanced in the same way as the crank pins and arms. The true reciprocating parts—pistons, wrist pin and upper parts of the connecting rods—balance each other.

3—As you say, some manufacturers claim to make inherently balanced crankshafts which need no counterweights and the claims seem to be well substantiated by engine performance. It is counter to our policy to comment on the practices of designers and manufacturers.

4—Gas engine power is dependent upon piston speed.

5—The only way in which to arrive at a definite conclusion is with the aid of a test card of the engine under consideration. The card of another engine of the same make will not do, for the reason that, as you are doubtless aware, there is considerable variation in engines of exactly the same dimensions. A graph showing power and torque at various engine speeds will enable you to calculate performance.

6—Gasoline and Kerosene Carburetors. Capt. Victor W. Page, published by U. P. C. Book Co., 239 W. 39th St., New York.

### RENEWING PARTS BY ELECTROPLATING

**Q**—We have read of a process of building up worn parts by electroplating used in England during the war. The report was that such parts as worn crank pins and shaft journals were built up by plating on iron and afterward dressing them to a true, round fit. Can you inform us regarding this?—H. A. Mincke, Wichita, Kans.

A full description of the process was published in the Oct. 14, 1920, issue of MOTOR AGE. The apparatus needed for the work is quite elaborate, consisting of cleaning and plating vats, wiring, volt and ammeters and a reliable source of current, preferably a motor-generator set with a capacity of 12 volts and about 20



amperes. The parts are first cleaned with a solution which can be procured from any electroplating supply house. The iron plating bath is composed of a nearly saturated solution of ferrous ammonium sulphate and a very small amount of sulphuric acid. The directions as given by the writer of the article call for a mixture of 75 grams of the chemical per liter of water. The addition of the sulphuric acid is recommended by the United States Bureau of Standards. The cleaning and plating vats are of wood, heavily pitch lined. As there must be some means of replenishing the iron of the solution as it is deposited on the parts, an anode—positive element—is made up of Swedish iron wire, carefully annealed, and woven or wound into the form of a cylinder. This is stiffened by means of soft iron rods which also serve the purpose of attaching the anode to rocker arms which keep it in motion during the plating process. It is also necessary that the solution be kept agitated. To accomplish this the anode is fitted with celluloid cones which have a pumping action. On no account must the solution become stagnant. The object of the peculiar shape of the anode is to completely surround the part being plated, it having been found that unless this is done the plate will be heavier on one side than on the other. There is some difference of opinion regarding the proper density of the current. The English authority gives it as .1 amp. per 30 sq. centimeter, while the Bureau of Standards recommends 20 amps. per square foot. As a rule, the slower the rate in any plating operation the finer and smoother the deposit. Of course, it is not necessary or desirable to coat the whole piece. Therefore, all parts of the work, other than bearing surfaces, are coated with wax. Melted paraffine, applied with a brush, is suitable. According to the best authorities on the subject of plating, the principal difficulty experienced in depositing iron is to prevent the oxidation of the solution. It is very unstable and likely to change chemically without warning, the iron combining with atmospheric oxygen and forming rust. On the whole, it is doubtful whether an inexperienced person should undertake the work as it is considered as the most difficult in the whole field of electroplating. The best results that have been attained have been from a coating of only 5/64 in. Under war-time stress when parts were extremely difficult to get, the savings were worth while, but at the present time it is, in our opinion, better to dress the part round, even at the expense of the small amount of stock it is necessary to remove, and fit the bearings to the smaller diameter.

#### AIR WASHER FOR AUTOMOBILE ENGINE

Q—Publish information regarding the Bennett air cleaner or any other type of air cleaner for carbureters.

2—Have air cleaners been tried out on passenger cars and trucks and, if so, with what success?—P. G. L. & C. Co. Garage, Chicago.

1 & 2—Although air washers have proven of considerable benefit on farm

#### The Readers' Clearing House

**THIS** department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of **MOTOR AGE** is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. **MOTOR AGE** reserves the right to answer the query by personal letter or through these columns.

Emergency inquiries will be replied to by letter or telegram.

tractors they have never been given the attention they merit by passenger car and truck manufacturers. There have been a few isolated instances of their

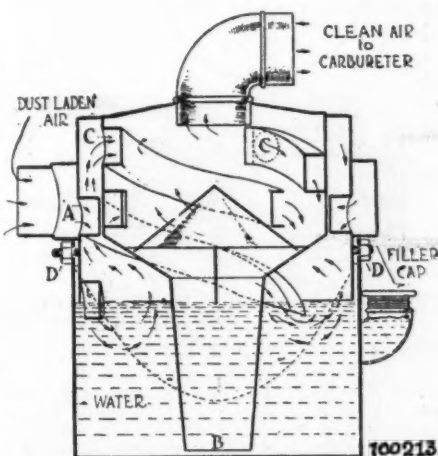


Fig. No. 4—Bennett centrifugal air washer

installation on such vehicles. The following description of the device concerning which you inquire was published in the Oct. 17, 1917, edition of this magazine.

The Bennett centrifugal air washer which is made by the Wilcox-Bennett Carburetor Co., Minneapolis, consists essentially of a Bennett air cleaner suspended within a cylindrical casing containing a quantity of water. The water is made to revolve within the container by the whirling action of the air drawn into it from the suction of the carburetor. The water rotates because the air is drawn into it tangentially through two spiral tubes in the inner circumference of the casing.

The dust-laden air enters the air washer and the water compartment through openings in the spirals at A. The whirling air causes the whole mass of water to revolve so it piles up against the sides in approximately the position shown by the dotted line. This completely submerges the lower end of the

spirals so all the air must pass through the water before escaping upward into the openings C of the inner air cleaner.

To clean the mud or dirt from the air washer, loosen nuts D, turn the water reservoir to free it from the catches on the studs and remove it, so it can be cleaned thoroughly. Do this frequently. The air washer should be cleaned every day, if it is used where there is much dust. Refill the reservoir to the filler cap each time after it has been cleaned and replaced.

The air and moisture pass through three spirals on the inner circumference of the cleaner. The centrifugal action set up in the inner cleaner completes the cleaning of the air and throws back any drops of water picked up in the air, into the water container through the open end of tube B. This reduces the humidity of the washed air and also prevents excessive water consumption. The clean air escapes upward after passing out of the spirals in the inner cleaner and goes out through the elbow at the top of the carburetor air intake.

The whirling of the water will keep the end of the tube B, which is very close to the bottom of the container, open enough for the water projected downward to re-enter the reservoir. If the water supply is allowed to evaporate entirely, however, enough mud and dirt will settle under the open end of tube B to seal it, so even if the container runs dry the inner air cleaner will collect the dust as a dry air cleaner. Of course, if the water container is dry and also clean, no such action is possible unless the opening B is closed.

In the normal temperatures one filling should last a full day.

#### SUGGESTED REMEDY FOR NOISY TIMING GEARS

We have a puzzler that I would like to have your opinion on. A 7-R Continental Red Seal engine has developed a grinding, whining noise in the front end. We wrote to the car manufacturer and he informed us that the trouble was in the idler gear and sent us another white metal one which has been installed, with no beneficial results. The noise is far worse than before. There are certain speeds of the engine at which the noise is eliminated, especially when the spark is retarded on low speed.—L. R. Hamman, Decatur, Ill.

The fault lies in the top half of the front main bearing. After this wears a trifle the gears mesh so deeply that the noise results. Such being the case it is natural that a new gear should make matters worse, as the teeth are a trifle more full than those of the old ones. There are two ways to remedy the trouble. The first is to replace the front main bearing with a new one. This will bring the gears into proper mesh again.

The second method is to replace the metallic crankshaft gear with a composition made up of strong laminations of strong cotton fabric and Bakelite. It is claimed that these gears are amply strong for the service required of them and that they eliminate the noise completely. They may be procured from Dalton & Balch, 2333 Michigan Ave., Chicago, Ill.

## ELECTRICAL SYSTEM

### TESTS FOR K. W. MAGNETO WINDINGS

**Q**—Describe in *MOTOR AGE* tests for the windings of a K. W., model T, magneto. Can the primary winding be tested with an ammeter and a 6-volt battery?

**2**—How many amperes should it draw?

**3**—How do you test for an open circuit in the secondary?

**4**—How do you test for a short circuit in the secondary?

**5**—Is there another test for a condenser besides the 110-volt test points and lamp?

**6**—Are the same tests applicable to all makes of magnetos?

**7**—What weight should a K. W. magnet lift?—L. Vilappe, St. Rose, DuLac.

**Fig. 5** will illustrate the following instructions:

**1**—The primary can be tested with a 6-volt battery and ammeter by connecting them in series at the points marked X and Y.

**2**—We have no information on this point; however, the discharge should be small.

**3 and 4**—With the winding removed from the magneto, insert a piece of soft iron into the center. This forms a core by taking the place of the shaft which occupies this position with the winding in place. Now connect a 6-volt battery and some sort of a vibrator at the points X and Y, as shown in Fig. 5. The vibrator may be that of a Ford coil if the condenser is in good condition.

Now with a 6-volt secondary wire connected at the secondary terminal make a 7/16 in. gap at the point marked X; if the winding is in good condition there will be a shower of sparks at this point. This test will not indicate what the trouble may be but merely whether the coil is in normal working order. The 110-volt test leads and lamp will determine whether there are any breaks in the primary or secondary windings but will not indicate short circuits.

**5**—The 110-volt test lead and lamp method is the best for testing condensers. Comparative tests can be made by substituting a known normal condenser for the suspected one. This, of course, cannot be done without opening the ignition coil and disconnecting the faulty unit.

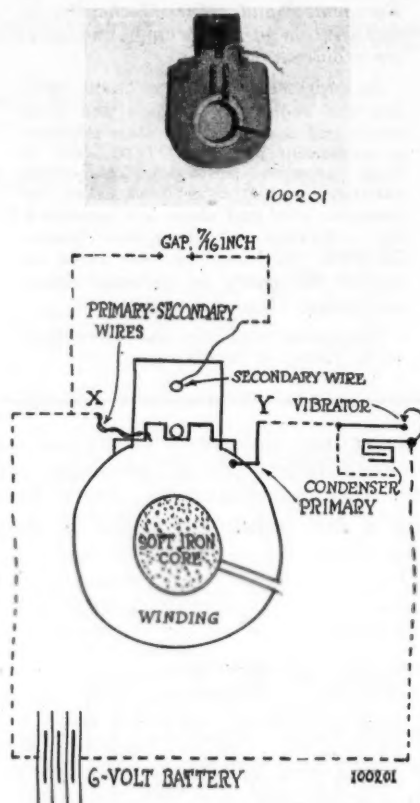
**6**—Roughly, yes. There are a few points of detail that differ with the different makes of magnetos.

**7**—We have no information on this point.

### JEFFERY CUTOUT DOES NOT CLOSE

**Q**—The cutout of a U. S. L. starting and lighting system used on a Jeffery 1915, 4-cylinder car does not close but remains closed after it has been pushed in by hand. It will sometimes close when the engine is running at a speed which would correspond to a car speed of 20 to 25 m.p.h. In the top of the cutout are three glass rods which hold either lead or fibre washers. These washers are about 1/4 in. thick. Should not one thick and one thin washer alternate throughout?

**2**—In regard to the Herschell-Spillman engine of a Lorraine car; this engine has been cleaned, the valves ground and adjusted and generally tuned up. It runs quite well while idling, but on a pull



**Fig. No. 5**—Two views of the K.W. magneto winding. Above, as it looks when removed. Below, a schematic diagram showing how to make tests

when feeding the gas with spark advanced it will knock. It sounds like a compression knock. Could not this be fixed by placing another gasket in the head?—Alfred Zehetner, Milwaukee, Wis.

**1**—The trouble lies in either worn brushes or high insulation between the commutator segments. The illustration shown in Fig. 6 will make the circuits of this system plain. It will be noted

that the shunt field circuit, that is, the one which magnetizes the fields of the generator, is independent of the circuit which leads to the battery. The trouble in this case is that until the cutout is closed by hand the fields of the generator do not build up.

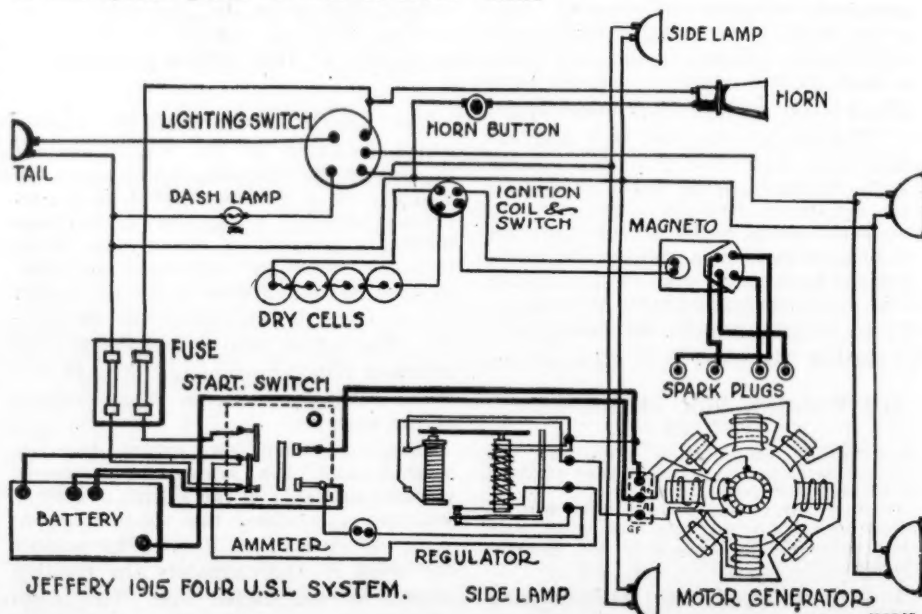
Upon closing the cutout the battery current surges around the series fields momentarily and induces such a heavy magnetism that the generator begins to generate. It will be found that when new brushes are installed and the insulation between the segments cut down, the shunt fields will begin to build up as soon as the engine gets up to speed; the resulting shunt field current will then cause the cutout to close normally.

The washers which are held in place by the three glass rods in the top of the regulator are made of carbon and not of lead or fibre. It makes no material difference what their thickness nor how they are disposed, as the regulation is dependent upon the pressure to which they are subjected. Under a heavy pressure they pass considerable current and allow the shunt fields to build up in strength. As the regulator goes into action and the pressure upon them is reduced, they automatically cut down the shunt field current. They require no care other than an occasional rubbing on fine sand paper to smooth off burnt spots.

**2**—If the bearings of this engine are in good condition we can think of nothing which would occasion the sharp knocking other than piston wear. The installation of another gasket may or may not improve matters. That it will do so is questionable, as the shape and size of the combustion chamber were accurately calculated at the time the engine was built.

### BURNT COMMUTATOR SEGMENT INDICATES ARMATURE TROUBLE

Short or open circuits in the armature coils of generators are usually indicated by burnt or blackened commutator segments. A test will show that these latter are always connected to the defective coils.



**Fig. No. 6**—Wiring diagram of U. S. L. system used on 1915 Jeffery car, showing detail of cutout



## ENGINES

### LOCATION OF STEPHENS OIL PUMP

Q—We are having trouble with a Stephens, model 76, oil pump. This pump cannot be seen from the outside of the motor, or from the bottom with the pan off, and seems to be located in the fly-wheel housing. Are we correct in this assumption? It is necessary to remove the transmission in order to get to it?—P. M. Elliott, Kingsville, Tex.

If you are correct in the model designation you have given us we are at loss to understand why you should be experiencing any trouble in locating the pump. The illustrations in Fig. 7 should prove of assistance to you. This lubricating system is of the full pressure type. You will notice in the illustrations that the oil flow is from the pump in a direct passage through the crankshaft where it is distributed from an annular groove up the passage which leads to the camshaft.

Upon arriving at the camshaft the oil passes a section at the shaft where there is a possibility of losing some of it if it has ever happened that the oil has become full of dirt. Another cause of the failure of the system is wear in the bronze bushings surrounding the shaft. It might happen that the gears of the pump have been replaced wrongly. This has happened in several instances we know of.

### TIMING FORD WITH 16-VALVE HEAD

Q—How do you time a Speedway Engineering Co. sixteen valve head?

2—Using all the latest improvement on the engine, what gear ratio would you suggest to be best on half mile track work?

3—Would you recommend a sliding gear transmission on such a job?—Johnnie Foster, Pittsburgh, Pa.

1—Use the standard timing, unless it is desired to replace the stock camshaft with the high-speed type manufactured by the concern mentioned.

2—3 to 1.

3—No.

### AUTOMATIC IGNITION IN ONE CYLINDER

Q—A 1917 Alds Six has been run a little over 6,000 miles. The motor has never been overhauled, but runs fine in every way—plenty of power and pickup, timing, carbureter, oiling and cooling systems, ignition switch and wires all right. About a year ago this trouble started: after a four or five-mile run, when the ignition switch has been turned off, and the motor has almost stopped, it will fire four or five shots, just as if it has been overheated. It seems to be just one cylinder firing. It does not get too hot, however, as the water never boils. The owner was told that carbon was the cause, but did not have it scraped out until the other day. The valves have not been out for two years, or 2,500 miles, but the trouble can hardly be caused by carbon on them, as we have seen motors that were full of carbon and ran all right.

This car uses a Delco system, and has five of the original AC plugs, and one Janesville.—Jos. J. Ruf, Allenton, Wis.

Any small point which projects into

the combustion chamber will become incandescent and give rise to this effect. Sometimes the cylinder head is not finished as smoothly as it should be, a small point of metal being left. Again small electrodes of the spark plugs will also become red or white hot and cause the trouble. A rare cause is a thick spot in the water jacket which causes one small spot to overheat.

### DOES FAULTY CONDENSER CAUSE ENGINE TO BACKFIRE?

Q—We have had some trouble with the engine of a Special Six series 20 Studebaker backfiring, and have been advised that the trouble is due to the condenser in the ignition system. Is it possible for a condenser, defective or not, to indirectly cause an engine to backfire?—E. C. Jewett, Baltimore, Md.

It is quite possible for a faulty condenser to have this effect, for the reason

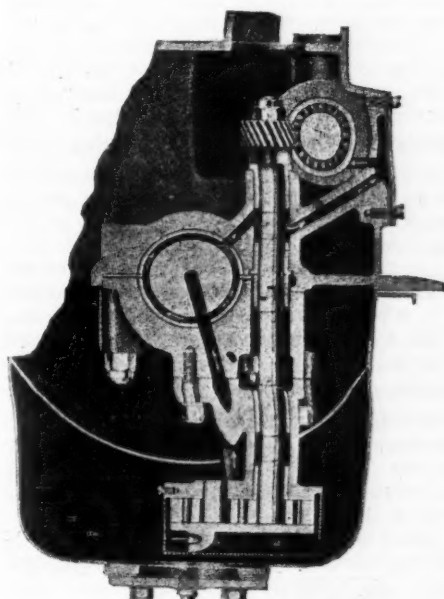


Fig. No. 7—Two views of the Stephens Salient Six oil pump. Above, a cross sectional view from the end of the crankcase. Below, the path of the oil through the force feed system is shown, as well as the location of the pump

that, though the spark appears to be of good quality when inspected, it is so thin and threadlike as it jumps across the spark plug that it fires the gas very slowly, if at all.

As you are probably aware, a mixture which is slow-burning for any reason continues to burn all during the exhaust stroke and up to the opening of the inlet valve. Of course, the incoming mixture in the intake manifold is fired by the slow flame and causes a backfire through the carbureter. Sometimes shortening the spark plug gap and enriching the mixture will permit of running with a faulty condenser until the unit breaks down completely.

### ENGINE HAD BAD KNOCK IN THE CAMSHAFT

Not long ago we had a Hudson 6-40 to overhaul. We reground the block, installed new piston rings and pins, tightened all the crankshaft and rod bearings, overhauled the clutch and transmission, and ground the valves after facing the seats and valves, but did nothing to the camshaft. When assembled there was a very bad knock somewhere. Finally, after much worry and waste of labor, we discovered that the trouble was a worn front camshaft bearing. After this part was replaced the engine was perfect.—W. E. Markle, 2751 California Court, Lincoln, Neb.

### SPEED REQUIREMENTS FOR DIRT TRACK RACING

Q—What speed is necessary for ½-mile dirt track racing, supposing track is good?

2—What speed is required for 1-mile dirt track racing?

3—How fast will a car have to be for ½-mile track racing?

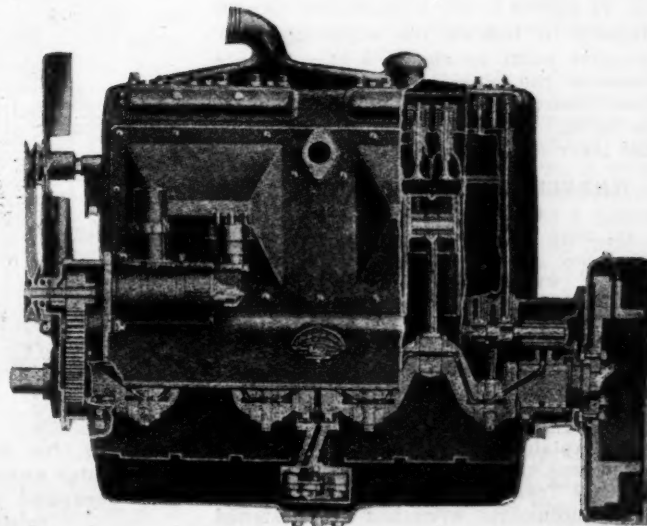
4—What wheelbase should be used?—Chas. H. Hyde, Bloomington, Ill.

1—You should be able to do between 55 and 56 m.p.h. on a ½-mile track.

2—The rate should be raised to about 65 m.p.h. for a 1-mile track.

3—Your car should be capable of doing 70 m.p.h. on a straightaway in order to attain the speed above mentioned on the track.

4—An average of 96 in. has been found to be very good.



## MISCELLANEOUS

### REMOVING AND ADJUSTING BORG & BECK CLUTCH

Q—Supply us with instructions on how to remove the Borg & Beck clutch from the flywheel of an Elcar 1920 model, 4-cylinder car, and how to disassemble it after it is removed.—Roy Shepherd, Jerusalem, C.

It will be necessary to remove the entire transmission. First, uncouple the driveshaft at the universal joint and drop it down. The transmission case is bolted to the flywheel housing with 10 or 11 bolts. Before removing these, mark the clutch cover plate and the flywheel drum with prick punch marks. This is very necessary as unless these parts are matched up when the clutch is assembled a great deal of trouble will be experienced. The marks are to be made on the parts marked "D" in the illustration, Fig. 8.

With the bolts removed the transmission case may be drawn backward and out. With the clutch out and on the bench it is released by the pedal and locked in the released position by inserting a block  $1\frac{1}{2}$  in. high and 4 in. long between the cover and the throwout yoke marked "E" in the illustration. On the back of the throwout yoke you will find a cap held by four screws. These must be removed and the cap taken off. Under the cap cover is a steel collar screwed onto a bronze sleeve. This should be unscrewed to remove the clutch spring.

After reassembling the clutch and installing it on the engine you will have to adjust it. Remove the large cover plate just in front of the bearing shaft lever on the transmission and turn the engine over until you can see the two adjusting nuts. Release the clutch pedal and with the clutch held out loosen both bolts and drive. Adjustment is secured by turning in a clockwise direction to tighten and anti-clockwise direction to loosen. Then allow clutch to engage. It will be in proper engagement when the distance between the brake faces at the back of the throwout yoke is about  $\frac{1}{2}$  in., as shown in the illustration. Do not neglect to tighten the adjusting nuts. Another point to check is the distance between the clutch lever and the car floor boards. This should be from  $\frac{3}{8}$  to  $\frac{1}{2}$  in. Under no circumstances must the lever touch the boards.

### WRENCHES, WHEELS, TIRES AND CLUTCH REMOVAL

Q—Why are the openings of automobile wrenches set at a 15 deg. angle to the handle while textile and blacksmith wrenches have the opening at an angle of 22½ deg.?

2—What is an artillery wood wheel and how does it differ from other types?

3—What is the difference between a 725, 725A, 725B, 725C and a regular 25 wrench?

4—What tire sizes are now considered standard?

5—Explain how to remove the leather faced cone clutch from a 1916 D 45 Buick?

—Kings Trail Garage, Austin, Tex.

1—Automobile wrenches are designed

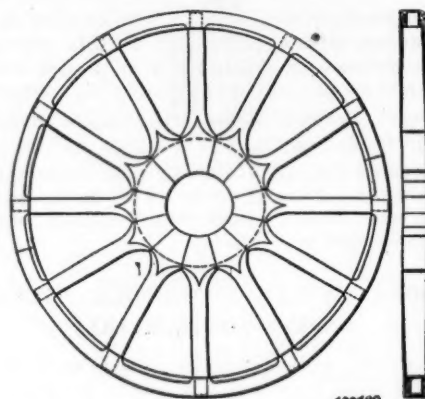


Fig. No. 9—A typical artillery type of wooden wheel. Note how the spokes are beveled to form wedges

for use on hexagon headed cap screws and hexagon nuts, while textile and blacksmiths' wrenches are designed for use on square headed bolts and cap screws and square nuts. This accounts for the difference in offset of  $7\frac{1}{2}$  deg.

2—The term "artillery wheel" is applied to any wheel which is made with the hub end of the spokes tapered or interlocking and held in position by side flanges. The term differentiates them from the old-fashioned type of wheel in which the spoke ends were simply driven into wooden hubs. An example of the artillery type wheel is shown in Fig. 9.

3—The wrenches are of the following openings: 725 hexagon cap screw wrench  $\frac{1}{4}$  and  $\frac{5}{16}$  in., opening  $\frac{1}{16}$  and  $\frac{1}{2}$  in.; 725 A hexagon cap screw wrench  $\frac{1}{4}$  and  $\frac{5}{16}$  in., opening  $\frac{1}{16}$  and  $\frac{1}{8}$  in.; 725 B hexagon cap screw wrench  $\frac{1}{8}$  by  $\frac{1}{8}$  in., opening  $\frac{1}{2}$  and  $\frac{1}{8}$  in. There is no 725 C wrench as the next number above 725 B is 726. The U. S. A. Standard number 25 wrench is a  $\frac{1}{4}$  and  $\frac{5}{16}$  in., with an opening of  $\frac{1}{2}$  and  $\frac{1}{8}$  in.

4—The standard tire sizes are as follows: 30x3, 30x3½, 31x4, 32x4, 33x4, 33x5,

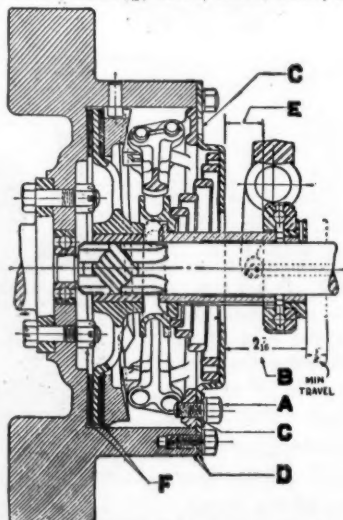


Fig. No. 8—Borg and Beck clutch assembly with the parts separated but retaining their relative positions

35x5, 37x5, 32x4½, 34x4½, 35x4½, 34x4, 36x4½, 33x5, 35x5, 37x5.

5—To disassemble the clutch and transmission the car should first be jacked up and suspended with a crane so as to remove the weight of the body and permit the removal of the spring saddle of the rear axle. Next remove the axle by taking out the cap screws which fasten the driving yoke to the driving ring at the rear of the transmission.

After the rear axle has been entirely removed, remove the transmission assembly from the bell housing by backing out the cap screws and backing off the nuts, after which the transmission ought to slip off without any trouble.

The clutch can then be removed by putting pressure on the clutch spring and removing the lock nut which fastens to the clutch spring stud. Care should be taken in handling this spring as it is very strong and might easily cause a lot of damage if permitted to expand suddenly.

### A MASS OF INFORMATION IN A SMALL SPACE

Q—What is the gear ratio of the Hudson four-passenger phaeton, the Chandler four-passenger Dispatch, and the four-cylinder Buick roadster?

2—What is the wheelbase of the Roamer two-passenger speedster, and the Roamer four-passenger touring?

3—Give the maximum speed of the new Buick four?

4—What is the maximum speed of the Mercer sporting model?

5—Give the weight of the Buick four-passenger roadster and the Buick six-passenger roadster?

6—Is a steam car more expensive to run than a gasoline car, both of them of the same weight?—Arthur Nelson, Cherokee, Ia.

1—Hudson, 4.90 to 1. Chandler, 4.40 to 1. Buick, 2 models, 4.00 to 1 and 3.75 to 1.

2—Roamer speedster, 128 in.; Roamer four-passenger touring, 130 in.

3—The Buick Motor Co. rates the Buick four at 50 m.p.h.

4—The Mercer is rated at from 75 to 80 m.p.h.

5—Buick four roadster about 2300 lbs.; Buick six roadster about 2900 lbs.

6—There is no record of a cost of running test between steam and gasoline cars of the same weight.

### REMOVING STORAGE BATTERY LEAD PARTS

A time-saving method for removing connectors or terminal lugs from the pillar posts of storage batteries is to heat the part to almost the melting point and then cut it off with a lead cutter. This will be found much faster than the older method of drilling. The fact that the part is spoiled is of small moment, as it can be quickly recast into a new part by the small moulds with which every first class battery service station should be equipped.

### EXPANDING PISTONS

As a makeshift expedient in an emergency, badly worn pistons can be expanded as much as .004 in. by heating them in a bed of charcoal and allowing them to cool therein. Refinishing to truth by grinding and lapping is then required.



## READER DESIRES TO KNOW A NUMBER OF THINGS

Q—The front axle and steering gear of the Oakland, Model 34 D, are described as semi-reversible. Why?

2—What is an artillery type of wheel?

3—What is meant by the camber of front wheels?

4—What are the Foucault currents in the laminations of an armature?

5—What causes them?

6—An Oakland 34 C coasting down grade with the clutch engaged jerks, but with clutch released, runs very smoothly. What is the reason?

1—You are mistaken in the terms. The front axle is described as full reversible for the reason that the spring saddles are so designed that it may be installed either side toward the front. The steering gear is described as irreversible. By this is meant that a road shock to the wheels is absorbed by the gearing and is not changed over into a twisting impulse of the steering column.

2—The artillery type of wheel is shown in Fig. 9 and described in the reply to King's Trail Garage.

3—By camber is meant that the wheels are not perpendicular but that they are tilted in such a way that the treads are closer together at the bottom than they are at the top. The object of cambering is to bring the bottom center of the tread as nearly as possible directly in a perpendicular line representing the direction of the load.

4 and 5—Foucault currents are those set up in the iron of armature. They are true electric currents and must not be confused with magnetism. Any metal, if moved within a magnetic field, has currents generated in it. The iron of armatures is no exception. If the part is one solid piece, the Foucault currents will surge back and forth throughout its entire length. As iron is a high resistance conductor, the rapid surging and eddyding will cause it to heat badly. For this reason all armatures and many field cores and frames are built up of thin laminations, insulated from each other by shellac or varnish. This does not entirely eliminate the Foucault effects but reduces them to the point where they do not seriously interfere with the efficiency of the apparatus.

6—In this case the condition is that of the car pulling the engine, which acts as a pump. The throttle being closed, only a thin mixture, too weak to fire except intermittently, can be drawn. This causes missing. Pumped into the muffler, the gasoline accumulates therein until a charge which has been fired comes through and explodes it, resulting in a muffler shot. Release the clutch when coasting, or, better still, disengage the gears. If it is desired to use the engine as a brake, engage the low gear, cut off the ignition and open the throttle to its limit.

Your other queries are being answered by mail.

## MYSTERY TALES

*YOUR mystery may be an open book to some other reader and, on the other hand, his problem may be an old story to you. So send in your mystery tales and give everybody a chance to exchange experiences. This practice will do us all good.*

## MYSTERY TALE

### End Motion in Shaft Breaks Distributer Rotar Pin

In your issue of July 28, under the head of Mystery Tales, you ask for an explanation of some of these so-called inexplicable mysteries. The first one was the "Adventure of the Hardened Pin" in a certain make of distributor. We had the same experience with one of these pins, and finally found the following condition:

The distributor shaft had a small amount of end play and under certain conditions the spirally cut gears that drive this shaft would force it upward. The shaft in this position seems to have a small amount of side play that does not exist when it is in the normal position, all the way down, apparently caused by the shaft's not being the same size throughout its entire length.

We also found that the pins in the distributor cap had been bent inward slightly, but not enough to permit the distributor block to touch them under normal conditions. But when the shaft rose and swung out of alignment the rotor did actually touch the pins, which fact accounted for the continual breakage mentioned.

(The above explanation has, of course, occurred to many of our readers, but Mr. Routhier is the first one to mention it. Thank you. Ed.)

## MYSTERY TALE

### Clogged Muffler Puzzles Expert

We had an occasion to look over a car a while ago that was deficient in power. Through the process of elimination it was determined that ignition, gas and compression were as they should be. We were frankly puzzled. However, while the engine was idling our attention was drawn to the rather peculiar sound made by the exhaust. Upon removal, the muffler was found to be choked. We burned out the carbon accumulation with oxygen, and the power of the engine was fully restored—W. J. Johnson, Hartford, Conn.

## MYSTERY TALE

### Switching Plugs Around Stops Engine Missing

Q—We have had cars drive in that were missing on one cylinder. Plugs were good, compression even, valves and springs in good condition, and yet one cylinder missed every shot. Upon changing the plugs from one cylinder to another the missing stopped. Care was taken not to change the plug gap.—Central Garage, Orlando, Fla.

This peculiarity has been noticed by thousands of mechanics. Sometimes it

is accounted for by the fact that when changing plugs from one cylinder to another small particles of carbon which collect across the spark plug gaps are knocked out. Again it is a matter of the difference of compression in cylinders. A plug with the gap set so wide that it will not fire a normally compressed charge will many times fire the charge in a cylinder which is not up to normal compression. The next time the condition is noticed we recommend that the compression be tested. (Expressions of opinion regarding the foregoing from the trade at large will be appreciated. Ed.)

## INTAKE MANIFOLDING

*Continued from page 17*

with a large pocket in the center and just below the branch. It was found that though the pocket caught most of the heavy parts of the fuel, some of the raw fluid was drawn over into the ends of the branches and collected in the bottle as before. Besides the bottles, thermometers were applied to the manifold through blind tubes. It was found that the average temperature at the cylinder parts was 235 deg. Fahr. This is interesting in view of the fact that the heavy ends of present-day fuels have a maximum boiling point of 446 deg. Fahr.

The temperature noted—235 deg.—was found to interfere with volumetric efficiency and the pipe shown in Fig. 6 was abandoned in favor of that shown in Fig. 7. It will be noted that the distance between the inlet and exhaust ports was increased. This had the effect of reducing the part temperatures to 175 deg. Fahr. The manifold finally adopted is shown in Fig. 8. No attempt was made to further reduce port temperatures and they remain at 175 deg.

It is interesting to see how the products of condensation are taken care of. It will be seen that the intake manifold is made with pockets below the ports. The assertion is that the heavy fluid collects in the pockets and is led by the small pipe to a large central pocket, where it remains until it is completely vaporized by the exhaust gases which pass around the last mentioned pocket. Scientific heat application is in its infancy and will, it is to be hoped, solve the heavy fuel problem which is becoming worse as time passes. In the words of the authority quoted in a preceding paragraph:

"I firmly believe that three-fourths of the service work performed on passenger cars and trucks would be eliminated if their intake systems were modified, and I believe and hope that the time is coming when the service departments of each responsible motor car and motor truck manufacturer will develop fittings and connections of this nature ("hot spots") to replace the equipment of cars now in service."

## WHO HAS PARTS FOR THIS ORPHAN CAR?

Q—Can you advise me where we can purchase parts for the Macon car manufactured by the All Steel Car Corp. of Macon, Mo.?—M. J. Berea, Forsyth, Mont.  
Only a few All Steel Cars were built and specifications are not on file.

# The Accessory Show Case

## New Fitments for the Car

### Signal Guards Oil, Fuel and Water

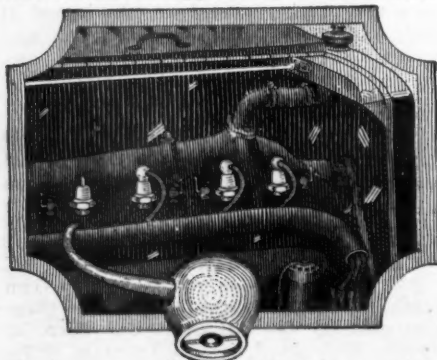
Telometer is an automatic signaling device that warns when the supply of oil or gasoline is running low or water in the radiator is in danger of freezing or boiling. When the oil or gasoline has reached a low level a light on the dash goes on and remains lighted until the tank is replenished. When the water in the radiator nears the freezing or boiling point this signal flashes on and continues lighted until the danger has been removed. The current required to operate this device is negligible. It is made to fit all makes of cars. Telometer Mfg. Co., 250 Main St., Binghamton, N. Y.

### Device Indicates Water Level in Radiator

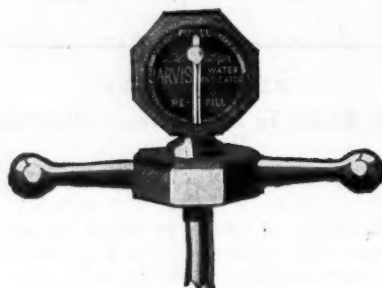
This water indicator attaches to the radiator of Fords in place of the regulation cap. A pointer on the face of the dial raises or drops with the water level in the radiator. Overheating from such causes as insufficient oil is manifested by constant motion of the indicator resulting from the agitation of the boiling water. Made of solid brass, nickled and polished, and has aluminum dial with raised lettering. Price, \$5 and \$7. Jarvis & Jarvis, Inc., 204 Monroe Ave., Grand Rapids, Mich.

### Peerless Liquid Stops Ford Band Chatter

A new liquid preparation recently placed on the market by the Columbus Varnish Co., Columbus, O., is said to remove the burned oil and carbon from Ford transmission band linings, soften and swell the lining material and thus eliminate the hard, glazed surface which causes chattering and jerking when starting or stopping the car. Among the claims made for the fluid are the facts that it can be applied by either owner



Wiederholdt terminals eliminate use of pliers or screwing of nuts

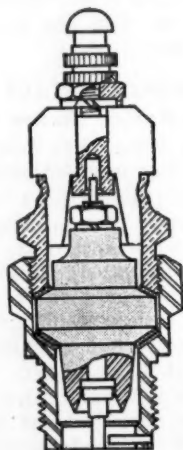


Device indicates water level in radiator

or mechanic in fifteen minutes and that one application has the effect of so reviving the lining that it becomes as good as new. As may be expected, this results in so prolonging the life of the linings that the necessity for their frequent renewal is avoided.

### Wiederholdt Terminals

These terminals are insulated with porcelain and intended to replace the usual insulated metal clip. Neither the use of pliers nor screwing of nuts is necessary, as they snap on. They can be taken off and put back while the engine is running, without giving an electrical shock to the operator's hands. Wiederholdt Terminals, St. Louis.



Hi-Power spark plug



Telometer automatic signal device and type of spring.

### Hi-Power Plug Has Spark Gap Inside

The spark gap is formed between the spindle extending through the porcelain top and the wire which extends above the top of the core. If a single contact plug is preferred a transformer is supplied. This transformer can be inserted in the spark gap, closing it and transforming it into a single contact plug. Hi-Power spark plugs are fitted with inverted copper-asbestos gaskets. The shell extends to the sparking points. Price, \$1.50. Protected Spark Plug Co., 3328 Olive St., St. Louis, Mo.

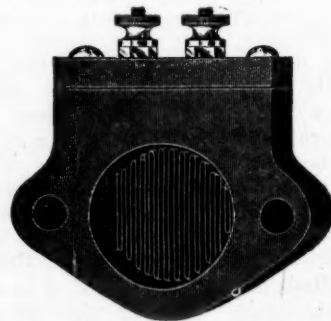
### General Storage Batteries for Fords

Designed especially for Ford service, the new general storage battery manufactured by the General Storage Battery Co., 2005 Locust St., St. Louis, altogether selling at the low price of \$25, is said to be in every way of the same high quality which characterizes the standardized line of the concern.

Among other features are California redwood insulation, carefully hand-pasted plates, and the new Anchor Seal method of locking the pillar posts in the cell covers, which method, it is asserted, absolutely prevents loosening of the parts and the detrimental creeping of acid.

### Heater for Vaporizing in Manifold

This is an electrical device designed to be placed between the carbureter and the intake manifold. The heating grate through which the vapor must pass is made of ribbon wire without insulation. One wire only is used, running from the battery to a switch on the dash and from there to the heater and grounded. The heater is switched off after the engine is warm. Manufactured by Asch & Co., 16-24 West 61st St., New York.



Electric heater for vaporizing in manifold



# Service Equipment

## Time Savers for the Shop

### Rule Calculates Machine Cutting Speed

A complete guide for setting the cutting or grinding speed of machine tools has been devised by R. Poliakoff, Mechanical Engineer, 709 Sixth Avenue, New York. Made in the form of a 12-in. rule, of a flexible composition material, the device is lithographed with both the standard English and metric scales. Besides these markings the ruler bears a number of others so correlated that the various factors of cutting and grinding calculations can be determined at a glance.

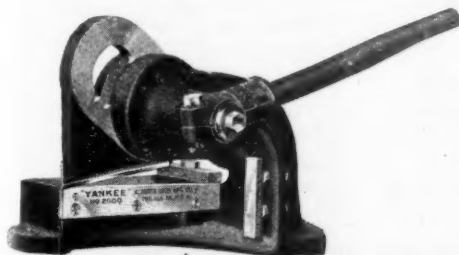
For instance, such problems as "given, diameter of bar and cutting or grinding speed; to find the number of revolutions per minute," and "given, diameter of bar and number of revolutions; to find cutting or grinding speed," are quickly solved. Another problem which can be instantly solved by the device is "given length of bar in inches, speed in inches per revolution and number of revolutions per minute; to find time (in minutes) required to turn or grind the bar."

Beside the foregoing, the scale calculates several other similar operations. The ingenious contrivance is not to be confused with the slide rule type of calculator as it is much simpler and is so worked out that it can be used by anybody with a limited knowledge of elementary arithmetic.

### "Yankee" Brake Lining Cutter Saves Time

Designed to shear brake lining and belting up to 6 in. in width and  $\frac{3}{8}$  in. in thickness, the "Yankee" cutter, recently offered to the trade by the North Bros. Mfg. Co., Philadelphia, Pa., cuts off the tough material with one pull of a powerful lever, leaving a clean square end. Although the device is intended for attachment to the work-bench, it may be used as a portable tool, as its net weight is but 22 pounds.

Being only  $11\frac{1}{2}$  in. long and  $7\frac{1}{4}$  in. wide, it occupies very little bench room.

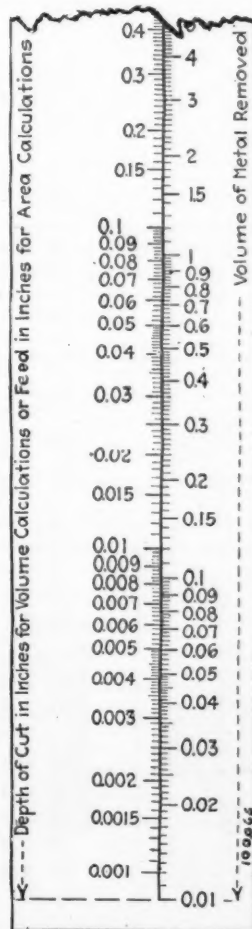


"Yankee" cutter readily shears tough material



Tiger battery recharging clip

The frame of the apparatus is a substantial casting finished in dead black and the high grade steel cutting blades are actuated by an amply long hand lever through the medium of a rack and pinion movement.



Rule calculates machine cutting speed

### Liquid Register Records Gasoline Sales

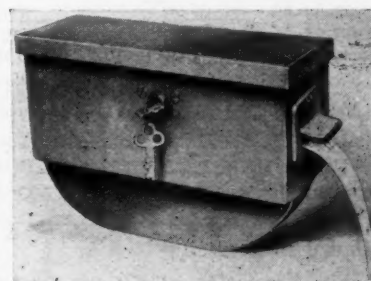
What might be called the cash register of the gasoline pump is the liquid gasoline recorder manufactured by the National Liquid Recording Corp., 74 Cortland street, New York. The device is designed for attachment to the gasoline pump and provides a complete record of all sales and deliveries of gasoline. The record is printed on a tape which feeds from the recorder as the pump is operated.

The register is designed to keep a record of both cash and charge sales; in the latter case the customer is required to sign that part of the tape showing his purchase. The apparatus is very compact, being contained in a small box, 7 in. long, 6 in. high and  $2\frac{1}{2}$  in. wide. Although principally designed to keep the record of gasoline sales, it may also be used for a like purpose covering oil transactions. The apparatus are priced at from \$35 to \$40 and are attached to the pump supported by small cap screws.

### Charging Clip Has Great Mechanical Strength

The DuChanois Electric Co. of Youngstown, O., is the manufacturer of the "Tiger" Battery Recharging Clip which is characterized by great mechanical strength as well as conductivity. Made of a heavily lead-coated acid resisting wire, the jaws of the new clip have the teeth arranged in such a way that a pull on the device causes them to sink deeply into the lead of either a terminal lug, straight post or cell connector.

When the clip loses its tension, which all clips are bound to do sooner or later, it is possible to restore it by simply separating the jaws and pulling the device out straight in such a way that the coiled spring in the top is restored to its original shape. So strong is the new clip that it is claimed it will support 100 pounds and that the average battery can be lifted with it by applying it to the post or the cell connectors.



National liquid recording register

# Make of Tires—Type of Rims Used on 1921 Passenger Cars

## Motor Age Maintenance Data Sheet No. 165

One of a series of weekly pages of information valuable to service men and dealers—save this page

Car and Model	Make of Tire	Size of Tire	Type and Make of Rim
Ace, all models.....	Firestone	32 x 4	S. S. Firestone
Allen, 43.....	Miller	32 x 4	S. S. Stanweld
Ambassador, R.....		32 x 4½	S. S. Distel Wheel
American Six—			
Open.....	Optional	32 x 4	S. S. Firestone
Closed.....	Optional	33 x 4½	S. S. Firestone
Anderson, all models.....	Firestone	33 x 4	S. S. Firestone
Apperson, all models.....	Optional	34 x 4½	S. S. Firestone
Auburn, 6-39.....	Goodrich	33 x 4	S. S. Firestone
Beggs, 20T.....	Goodrich	33 x 4	S. S. Firestone
Birch, 30.....		30 x 3½	C. Stanweld
Birch, 40 and 60.....	Firestone	33 x 4	S. S. Firestone
Bour-Davis, 21S and 21R.....	Goodyear	33 x 4½	S. S. Firestone
Brewster, G1.....	Firestone	32 x 4½	S. S. Firestone
Briscoe, 4-34.....	Miller	31 x 4	Q. D. Hayes Wheel
Brook, S-21.....	Optional	28 x 3	C. Dayton
Buick, 21, 44-5-6.....		33 x 4	S. S. Jackson
Buick, 21, 47-8-9-50.....		33 x 4½	S. S. Jackson
Cadillac, 59, all models—			
125-in. wheelbase.....	Goodyear	34 x 4½	S. S. Kelsey
132-in. wheelbase.....	Goodyear	35 x 5	S. S. Kelsey
Case, V.....	Goodyear	34 x 4½	S. S. Firestone
Chalmers—			
5-pass. models.....		32 x 4	S. S. Kelsey
7-pass. models.....		33 x 4½	S. S. Kelsey
Champion—			
Special.....	Goodrich	32 x 4	S. S. Standard and Firestone
Touring and commercial.....	Goodrich	32 x 3½	S. S. Standard and Firestone
Chandler—			
Open models.....	Goodrich	33 x 4	S. S. Firestone
Closed models.....	Goodrich	34 x 4½	S. S. Firestone
Chevrolet, 490.....		30 x 3½	C. Dmtbl. Jaxon
Sedan and coupe.....		31 x 4	C. Dmtbl. Jaxon
FB-20, 30, 40 and 50.....		33 x 4	C. Dmtbl. Jaxon
Cleveland, 40.....	Goodrich	32 x 4	S. S. Firestone
Climber—			
4-40.....	Goodyear	33 x 4	S. S. Jaxon
6-50.....	Goodyear	32 x 4½	S. S. Jaxon
Cole, 870.....	Goodrich	33 x 5	S. S. Firestone
Columbia Six.....	Firestone	32 x 4	S. S. Firestone
Comet, C-53-2.....	Firestone	33 x 4½	S. S. D. Firestone
Commonwealth, 44.....	Goodrich	33 x 4	S. S. Firestone
Crawford, 21-6-40.....	Goodrich	32 x 4	S. S. Firestone
Crow-Elkhart—			
L-63-64-65.....	Firestone	32 x 3½	S. S. Firestone
S-63-64-65-67.....	Firestone	33 x 4	S. S. Firestone
Cunningham, V-4.....	Optional	35 x 5	S. S. Firestone
Daniels, D-19.....	Optional	34 x 4½	S. S. Firestone
Davis, 51-57.....	Goodrich	33 x 4	S. S. Firestone
Dixie-Flyer, HS70.....	Fisk	32 x 4	S. S. Stanweld
Dodge Brothers, 1921.....	Optional	32 x 3½	S. S. Kelsey
Dorris, 6-80.....	Optional	33 x 5	Q. D. R. Firestone

Continued next week

Abbreviations: "C." clincher, "S. S." straight side, "Q. D. C." quick detachable clincher, "Dmtbl." demountable.



# Automotive Repair Shop

## Practical Maintenance Hints

### Overhead Light Controlled from the Floor

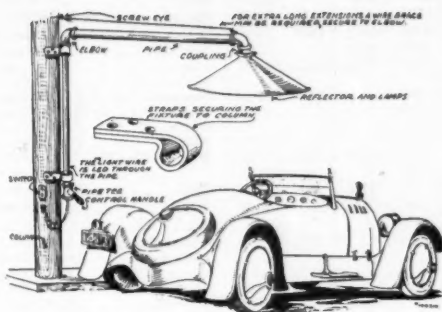
A fixed flood light for the shop at one position on the ceiling is not the most desirable or convenient arrangement inasmuch as shadows and dark places result when a car is driven into the shop. To avoid this situation a repairship arranged a flood light on a swinging arm, as is shown in the accompanying illustration, with an extension for rotating it from the floor and placing the light over the car, as desired.

The bracket for this light was made inexpensively and quickly from pipe material, a horizontal piece being placed at the ceiling. This was coupled by means of an elbow to a vertical section, and at a convenient place to reach, a short section was secured as a handle to the vertical part by a pipe "tee." The wiring was led through the "tee" and out at the end of the swinging arm, where the lamp socket and reflector were screwed into a coupling.

Two straps fixed the vertical section to a column so that it was free to be rotated by hand. The light swings through a large arc, the size depending, of course, upon the length of pipe used. The light is easily placed at the most desirable position throughout the length of the car.

### Bench With Drain for Washing Car Parts

The illustration shows a simple method of fitting a bench for washing car parts to avoid the kerosene's draining on the floor and making a messy job. Additionally, the kerosene or gasoline used for washing the parts is recovered and can be used over again. The edges of the bench are fitted with 3-in. troughs all around. A down spout is fixed at one end with a bucket hanging underneath to catch the liquid. The trough is slanted slightly to insure the flow of the

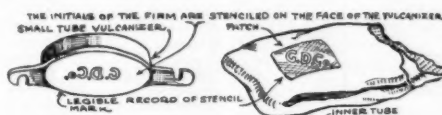


Flood light on swinging arm

liquid. This can be applied to practically any bench and the saving in the cleaning fluid rapidly pays the cost of the material used. By the use of two buckets a continuous supply of fluid cleaner is always at hand.

### Cooperation

COOPERATION is the keynote of the automotive industry this year and will become more important as time goes on. Motor Age is pleased to extend an invitation to its readers, wherever they may be, to contribute short articles and sketches on easy or improved ways of doing hard things, which they may have worked out and thus lend their aid in HELPING THE OTHER FELLOW. Correspondence among contributors is also strongly urged. Let's get together and make this a happy family with one end in view, that of hearty, unselfish COOPERATION.



Initials on the vulcanizer identify repairs and avoid mistakes

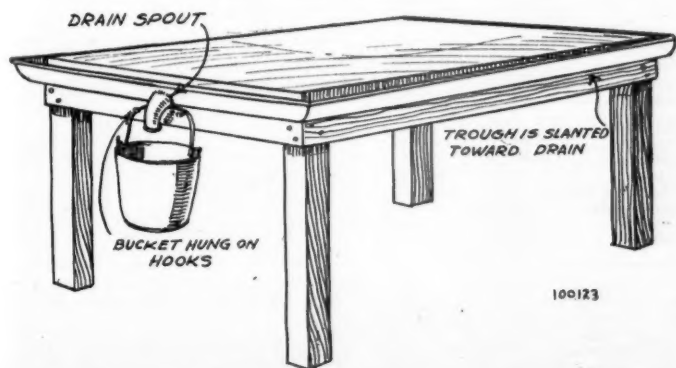
### Method of Winding Springs in Lathes

Many mechanics know the procedure for winding springs in a lathe; however, only a few know the method which produces the longest spring in one part or the surest method of feeding the wire on the mandrel to obtain a uniform tension and a uniform pitch. In the method, as shown below, a spring 20 in. or more in length has been wound from piano wire, with a uniform pitch to the coils, on a mandrel  $\frac{1}{8}$  in. in diameter. To feed the wire and hold it for sufficient tension, two blocks of red fibre or of oak are placed with the wire between them, in the tool post, and pressure is applied by means of the tool post screw.

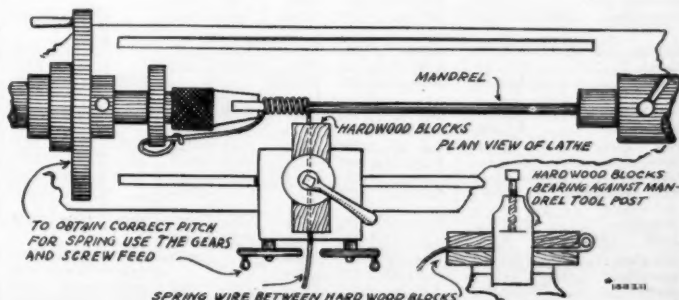
The ends of the block are run out with the cross feed until these bear against and act as a steady rest for the mandrel. The back gears are set for a feed to give the pitch, as in cutting a screw. These methods take the guesswork out of spring winding, and instead of the springs being in the usual short lengths, a couple of feet of spring is turned out at once and is cut up, as required.

### Initials on the Vulcanizer Identify Repairs

An effective method of recording tube repairs in a tire shop consists in marking the face of each tube vulcanizer with the initials of the firm. A vulcanized tube so marked is readily identified, and the shop knows from this marking, when a customer brings in a defective repair, whether or not the complaint is justified. The letters on the face of the vulcanizer, though not deep, are legibly recorded in the rubber. For the sake of appearance they should be reversed in the vulcanizer.



Simple method of fitting a bench for washing car parts



Simple method in overcoming difficulties in winding springs in lathes

## Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan	NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....G	Guy	6-3 1/2 x 5	123	32x4	\$2975	\$2975		\$3680	\$3680	Maibohm.....B	Falls	6-3 1/2 x 4 1/2	116	32x4	11575	\$1575	\$1575	\$2395	\$2395
Ace.....H	H-S.	6-3 1/2 x 5	123	32x4	2975	2975		3680	3680	Marmen.....34	Ow.	6-3 1/2 x 4 1/2	130	32x4 1/2	4185	3985	4575	5275	
Ace.....L	H-S.	4-3 1/2 x 5	116	32x4	2260	2260				Maxwell.....25	Ow.	4-3 1/2 x 4 1/2	109	30x3 1/2	845	845	1445	1545	
Allen.....Series 43	Ow.	4-3 1/2 x 5	110	32x4	1385	1385				McFarlan.....1921	Ow.	4-3 1/2 x 4 1/2	140	33x5	6300	6300	7500	7500	
Ambassador.....R	Cont.	6-3 1/2 x 5 1/2	136	33x5		14500	\$4500			Meritor.....Series 5	Ow.	4-3 1/2 x 4 1/2	132	32x4 1/2	4100	4500	5700	6200	
American.....C	H-S.	6-3 1/2 x 5	127	32x4	2195	2195	2350		3150	Mitchell.....F-40	Ow.	6-3 1/2 x 5	120	33x4	1490	1490	2590	2690	
Anderson.....Series 40	Cont.	6-3 1/2 x 4 1/2	120	32x4	2195	1795	1845	2795	2795	Mitchell.....F-42	Ow.	6-3 1/2 x 5	127	33x4			1795		
Apperson.....8-21-S	Ow.	8-3 1/2 x 5	130	34x4 1/2		3000	3250	4500	4500	Moller.....A	Ow.	4-2 1/2 x 4	100	27x3 1/2	2000				
Apperson.....Anniversary	Ow.	8-3 1/2 x 5	130	34x4 1/2		3500	3750			Monroe.....S-9 & 10	Ow.	4-3 1/2 x 4 1/2	115	32x3 1/2	1285	1295			
Auburn.....6-51	Cont.	6-3 1/2 x 4 1/2	121	32x4	167 1/2	1695	1760	2475	2465	Monroe.....S-11 & 12	Ow.	4-3 1/2 x 4 1/2	115	33x4			2075	2175	
Beggs.....207	Cont.	6-3 1/2 x 4 1/2	120	33x4	1775	1775		2675	2775	Moore.....6-48	Cont.	6-3 1/2 x 5 1/2	125	32x4 1/2			2485	2685	
Ball.....4-32	H-S.	4-3 1/2 x 5	114	31x4		1495				Murray-Mac Six.....	Ow.	6-3 1/2 x 5 1/2	128	34x4 1/2	4250	4250	4250		
Ball.....6-50	H-S.	4-3 1/2 x 5	124	32x4		1695				Nash.....681-7	Ow.	6-3 1/2 x 5	121	33x4	1525	1545	11695	2395	
Biddle.....B1	Buda.	4-3 1/2 x 5 1/2	121	32x4	3475	3475			3975	Nash.....682	Ow.	6-3 1/2 x 5	127	34x4 1/2			1695		
Birch Super-Four.....	H-S.	4-3 1/2 x 5	117	33x4	1195	1195	1245	2295	1795	Nash Four.....41-4	Ow.	4-3 1/2 x 5	112	32x3 1/2	1175		1735	1935	
Birch Light Six.....	Left.	4-3 1/2 x 4 1/2	108	30x3 1/2	1045	1045				National Sextet.....BB	Ow.	6-3 1/2 x 5 1/2	130	32x4 1/2	2900	2900	3900	3900	
Birch Light Six.....	H-S.	4-3 1/2 x 4 1/2	117	33x4	1395	1395	1445		1995	Nelson.....D	Ow.	4-3 1/2 x 4 1/2	128	32x4 1/2				4450	
Bour-Davis.....215	Cont.	6-3 1/2 x 5 1/2	125	33x4 1/2	2385	2385			10500	Noma.....1C	Cont.	6-3 1/2 x 4 1/2	128	32x4 1/2	3000	3200	4200	5400	
Brewster.....91	Ow.	4-4 x 5 1/2	125	32x4 1/2	17000	7000				Northway.....	Ow.	6-3 1/2 x 5 1/2	128	33x5	4200	4200	6000	5400	
Briscoe.....4-34	Ow.	4-3 1/2 x 5	109	31x4	1085	1085		1685	1685	Norwalk.....430-KS	Lyc.	4-3 1/2 x 5	116	32x3 1/2		1035			
Brook.....S-21-A	Ow.	2-3 1/2 x 3 1/2	90	28x3	395					Oakland.....34-C	Ow.	6-2 1/2 x 4 1/2	115	32x4	1095	1195	1265	1725	
Buick.....1922-34-35-36-37	Ow.	4-3 1/2 x 4 1/2	109	31x4	935	975		1475	1650	Ogden.....6-60	Ow.	6-3 1/2 x 5 1/2	134	33x5	13550	3750	5000	5400	
Buick.....1922-44-5-6-7	Ow.	4-3 1/2 x 4 1/2	118	33-4 1/2	1495	1525		2135	2435	Oldsmobile.....43-A	Ow.	4-3 1/2 x 5 1/2	115	32x4	1325	1345	1855	2100	
Buick.....1922-48-9-50	Ow.	6-3 1/2 x 4 1/2	124	34x4 1/2			1735	2325	2635	Oldsmobile.....37-A	Ow.	6-2 1/2 x 4 1/2	112	32x4	1450	1450	2145	2145	
Bush.....E.C.A.	Lyc.	4-3 1/2 x 5	116	33x4		1195				Oldsmobile.....46	Ow.	8-2 1/2 x 4 1/2	122	33x4 1/2		1875	2775		
Bush.....E.C.B.	Rut.	6-3 1/2 x 5	116	33x4		1345		1750	1850	Oldsmobile.....47	Ow.	8-2 1/2 x 4 1/2	115	32x4		1725	2225	2425	
Cadillac.....59	Ow.	8-3 1/2 x 5 1/2	132	35x5		3790	3790		4950	Overland.....4	Ow.	4-3 1/2 x 4	100	30x3 1/2	695	695	1000	1275	
Carroll.....C	Roch.	6-3 1/2 x 5	128	32x4 1/2	3185	3185			5190	Packard.....Single-Six	Ow.	6-3 1/2 x 4 1/2	116	33x4 1/2	2975	2975	2650	3975	
Case.....V	Cont.	6-3 1/2 x 5 1/2	126	34x4 1/2		2250	2250	2900	3285	Packard.....Twin-Six	Ow.	12-3 x 5	136	35x5	4850	4850	4850	5075	
Chalmers.....V	Ow.	6-3 1/2 x 4 1/2	117	32x4	1495	1545		2295	2445	Paige.....6-42	Ow.	6-3 1/2 x 5	119	32x4	1695	1695	2450	2575	
Chalmers.....6-30	Ow.	6-3 1/2 x 4 1/2	122	33x4 1/2			1795			Paige.....6-66	Ow.	6-3 1/2 x 5	131	33x4 1/2	12975	13295	2875	3850	
Champion.....Tourist	Lyc.	4-3 1/2 x 5	113	32x3 1/2		1095				Pan American E&F-55	H-S.	6-3 1/2 x 5	121	33x4	2000	2000	2100		
Champion.....Special	H-S.	4-3 1/2 x 5	118	32x4	1395	1395				Parenti.....1921	Ow.	8-2 1/2 x 4 1/2	125	32x4	2000	2000		3100	
Chandler.....Six	Ow.	6-3 1/2 x 5	123	33x4	1785	1785		2785	2885	Patterson.....650	Cont.	6-3 1/2 x 4 1/2	120	33x4		1505	1615	2815	
Chevrolet.....490	Ow.	4-3 1/2 x 4 1/2	102	30x3 1/2	625	625		975	975	Peerless.....56-S-7	Ow.	8-3 1/2 x 5	125	34x4 1/2		1960	2990	3410	
Chevrolet.....FEB	Ow.	4-3 1/2 x 4 1/2	110	33x4	975	975		1575	1575	Peters.....	Ow.	2-3 1/2 x 3 1/2	90	28x3	385				
Cleveland.....40	Ow.	6-3 x 4 1/2	112	32x4	1295	1295		2195	2295	Piedmont.....4-30	Lyc.	4-3 1/2 x 5	116	32x3 1/2		970			
Climber Four.....	H-S.	4-3 1/2 x 5	115	33x4	1450	1385				Piedmont.....6-40	Cont.	6-3 1/2 x 4 1/2	122	32x4		1275			
Climber Six.....	H-S.	8-3 1/2 x 5	125 1/2	32x4 1/2	2250	2250				Pierce-Arrow.....	Ow.	6-4 x 5 1/2	128	33x5	7000	14500	6500	8500	
Cole.....570	Nort.	6-3 1/2 x 5	127	33x5	2550	2605	2795	3095	3095	Pilot.....6-45	Teetor	6-3 1/2 x 5	120	32x4	1945	1855			
Columbia Challenger.....	Rut.	6-3 1/2 x 5	115	32x4		1195	1195	1995	1995	Pilot.....6-50	H-S.	6-3 1/2 x 5	126	32x4 1/2	2285	2285	3350	3400	
Columbia.....D-C&CS	Cont.	6-3 1/2 x 4 1/2	115	32x4	1475	1475	1475	2295	2350	Porter.....40	Ow.	4-4 x 6 1/2	142	35x5	6750	Chassis Price			
Comet.....C-53	Cont.	6-3 1/2 x 5 1/2	125	33x4 1/2		2350	2450		3650	Premier.....6-D	Ow.	6-3 1/2 x 5 1/2	126 1/2	33x5	3790	13690	3890	4690	
Commonwealth.....44	H-S.	4-3 1/2 x 5	117	32x4		1395		2465		Premocor.....6-40	Falls	6-3 1/2 x 4 1/2	117	33x4	1295				
Crawford.....21-4-40	Cont.	6-3 1/2 x 5 1/2	122 1/2	32x4	3000	3000	3000		4500	Raleigh.....A-6-60	H-S.	6-3 1/2 x 5	122	32x4 1/2	2250	2250	3100	3200	
Crow-Ellhart.....L-63-65	Lyc.	4-3 1/2 x 5	117	32x3 1/2	11295	1295				R & V Knight.....R	Ow.	4-3 1/2 x 5	116	32x4	2150	2150	2850	2950	
Crow-Ellhart.....S-63-65	H-S.	6-3 1/2 x 5	117	33x4	11545	1545		2395		R & V Knight.....J	Ow.	6-3 1/2 x 4 1/2	127	32x4 1/2	3350	3350	4000	4200	
Daniels.....D-19	Ow.	8-3 1/2 x 5 1/2	132	34x4 1/2	15350	15350	5350	6250	6950	Reo.....T-6	Ow.	6-3 x 5	120	33x4	1650	1650	2700	2750	
Davis.....61-67	Cont.	6-3 1/2 x 4 1/2	120	32x4	11995	1895	11995	2795	2795	Revere.....C	Dues.	4-4 1/2 x 6	131	32x4 1/2	4850	4850	4650	6500	
Dispatch.....	Wisc.	4-3 1/2 x 5	120	34x4	1250	1350	1350	1525	1575	Roemer.....6-54-E	Cont.	6-3 1/2 x 5	128	32x4 1/2	3150	3150	3985	4100	
Dixie Flyer.....H-S-70	H-S.	4-3 1/2 x 5	112	32x4	1445	1445	1945	2295	2345	Roemer.....4-75-E	Dues.	4-4 x 6	128	32x4 1/2	4150	3985			
Dodge Brothers.....	Ow.	4-3 1/2 x 4 1/2	114	32x4	935	985		1585	1785	Rolls-Royce.....	Ow.	6-4 1/2 x 4 1/2	143 1/2	33x5	U. S. Chassis Price	11750			
Doris.....6-80	Ow.	6-4 x 5	132	33x5		14785	4785	5800	6690	Romer.....	Cont.	6-3 1/2 x 4 1/2	120	33x4	2000	2000	2100	2450	
Dort.....17-12	D-Ly.	4-3 1/2 x 5	108	31x4	985	985		1535	1685	Saxon.....125	Ow.	4-3 1/2 x 5	112	32x4	1545	1495	2265	2265	
Driggs.....	Ow.	4-2 1/2 x 4 1/2	104	30x3 1/2	1275	1275		1975		Sayers Six.....DP	Cont.	6-3 1/2 x 4 1/2	118	33x4	2145	1945		2915	
Dupont.....A	Ow.	4-3 1/2 x 5	124	32x4 1/2	3400	3400		4900		Scripps-Booth.....B-39-42	Nort.	6-2 1/2 x 4 1/2	115	32x4	1275	1295	1950	2100	
Durant.....A-22	Cont.	4-3 1/2 x 4 1/2	109	31x4		890		1365	1365	Scripps-Booth.....F-43-46	Cont.	6-3 1/2 x 4 1/2	115	32x4	1470	1490	2350	2375	
Elcar.....K-4	Lyc.	4-3 1/2 x 5	117	33x4	1195	1195				Seneca.....L & O	LeR.	4-3 1/2 x 4 1/2	108	30x3 1/2	1045	1045			
Elcar.....K-1	Falls	6-3 1/2 x 4 1/2	118	33x4	1595	1595	1595	2395	2395	Severin.....Six	Cont.	6-3 1/2 x 5	122 1/2	33x4 1/2	1485	1485	2100	2250	
Essex.....	Ow.	4-3 1/2 x 5	108 1/2	32x4	1375	1375		1880	2230	Skelton.....Six	Cont.	6-3 1/2 x 5	122 1/2	33x5	2550	2550	3250	3350	
Fergus.....S-5-21	Ow.	6-3 1/2 x 5	126	33x4 1/2			Chassis Price	8500		Southern Six.....660-2	H-S.	6-3 1/2 x 5	127	32x4 1/2	2375	2375			
Ferris.....C-20	Ow.	6-3 1/2 x 5 1/2	130	32x4 1/2	2695		2595		3675	Standard.....J	Ow.	8-3 1/2 x 5	127	34x4 1/2	3400	3400	4500	4600	
Ford.....T	Ow.	4-3 1/2 x 4	100	30x3 1/2	*370	1415		695	760	Stanley Steamer.....	Ow.	2-4 x 5	130	34x4 1/2	2800	2600	3775	3850	
Franklin.....9-B	Ow.	6-3 1/2 x 4	115	32x4	2550		2250	2850	3650	Stanwood Six.....	Cont.	6-3 1/2 x 4 1/2	118	33x4	2050	2050	2650		
Friend.....Four	Ow.	4-3 1/2 x 4 1/2	112	32x3 1/2	11285	1285		1985	2085	Stearns.....SKLA	Ow.	4-3 1/2 x 5 1/2	122	34x4 1/2	2450	2450	2675	3700	
Gardner.....G	Lyc.	4-3 1/2 x 5	112	32x3 1/2	1995	995			1795	Stevens Duryea.....E	Ow.	6-4 1/2 x 5 1/2	138	35x5	7250	10000	6800	6900	
Grant.....Six	Ow.	6-3 1/2 x 4 1/2	116	32x4	1550	1550		2450	2450	Studebaker.....E-40	Ow.	6-3 1/2 x 5 1/2	112	32x4	1300	1335	1		



## Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive
				Front	Rear						Front	Rear	
Acadon	1 1/2	\$1650	3 1/2 x 5	34x5 1/2	34x5 1/2	W	Cook, 41	2	\$3000	4 x 5 1/2	36x6 1/2	38x7 1/2	I
Acadon, R	1 1/2	2260	3 1/2 x 5 1/2	36x3 1/2	36x5	W	Corbitt, H	1 1/2	1800	3 1/2 x 5	35x5 1/2	35x5 1/2	B
Acadon, RB	1 1/2	2485	3 1/2 x 5 1/2	36x3 1/2	36x6	W	Corbitt, E	1	2200	3 1/2 x 5	34x3 1/2	34x4	W
Acadon, H	2 1/2	3295	4 1/2 x 5 1/2	36x4	36x8	W	Corbitt, D	1 1/2	2600	3 1/2 x 5	36x3 1/2	36x5	W
Acadon, L	3 1/2	4295	4 1/2 x 5 1/2	36x5	36x10	W	Corbitt, C	2	3150	4 1/2 x 5 1/2	36x3 1/2	36x7	W
Acadon, M	5	5250	5 x 6 1/2	36x6	40x12	W	Corbitt, B	2 1/2	3300	4 1/2 x 5 1/2	36x4	36x7	W
Ace, C	1 1/2	2295	3 1/2 x 5 1/2	34x3 1/2	34x5	W	Corbitt, A	3 1/2	4100	4 1/2 x 5 1/2	36x5	36x10	W
Ace, A	2 1/2	2795	4 1/2 x 5 1/2	36x4	36x7	W	Cyclone A	5	5000	4 1/2 x 6	36x6	40x6 1/2	W
Acme, G	1 1/2	....	3 1/2 x 5	35x5 1/2	35x5 1/2	W	Dart, S	1 1/2	2685	3 1/2 x 5	34x3 1/2	34x6	W
Acme, B	1	....	3 1/2 x 5	34x3 1/2	34x5	W	Dart, M	1 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W
Acme, F	1 1/2	....	3 1/2 x 5	34x3 1/2	34x5	W	Day-Elder, A	1 1/2	2100	3 1/2 x 5	34x3 1/2	34x4	W
Acme, AC	2 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W	Day-Elder, B	1 1/2	2300	3 1/2 x 5	34x3 1/2	34x5	W
Acme, C	3 1/2	....	4 1/2 x 5 1/2	36x5	40x10	W	Day-Elder, D	1 1/2	2750	4 1/2 x 5 1/2	36x4	36x7	W
Acme, E	3 1/2	....	4 1/2 x 6	36x6	40x12	W	Day-Elder, E	1 1/2	3025	4 1/2 x 5 1/2	36x4	36x7	W
Akr Multi-Trk 20	1	1995	4 x 5 1/2	34x5	34x5	B	Day-Elder, F	3 1/2	3750	4 1/2 x 5 1/2	36x5	36x5 1/2	W
All-Power, C	3 1/2	5800	4 1/2 x 6	36x7	36x10	W	DeMartini 3	5	4250	4 1/2 x 6	36x5	40x6 1/2	W
All-American, B-1	1	1795	3 1/2 x 5	32x4	32x4	I	DeMartini 4	1	1700	3 1/2 x 5	35x5 1/2	35x5 1/2	W
All-American C-1	1 1/2	2195	3 1/2 x 5	34x4	34x5	I	DeMartini 5	1 1/2	2300	3 1/2 x 5	34x4	34x5	W
American, 25	2 1/2	3350	4 x 6	36x4	36x4 1/2	W	DeMartini 6	1 1/2	2180	3 1/2 x 5	34x4	34x5	W
American, 40	4	4275	4 1/2 x 6	36x5	36x5 1/2	W	DeMartini 7	2	2590	3 1/2 x 5	35x5 1/2	34x7 1/2	W
Apex, G	1	1450	3 1/2 x 5	33x5 1/2	33x5 1/2	I	DeMartini 8	1	1975	3 1/2 x 5	35x5 1/2	35x5 1/2	I
Apex, D	1 1/2	1915	3 1/2 x 5 1/2	34x3 1/2	34x4	I	DeMartini 9	1 1/2	2550	3 1/2 x 5	35x5 1/2	36x6 1/2	I
Apex, E	1 1/2	2095	4 1/2 x 5 1/2	36x4	36x7	I	DeMartini 10	2	2750	3 1/2 x 5	35x5 1/2	38x7 1/2	I
Apex, F	3 1/2	3975	4 1/2 x 6	36x5	36x10	I	DeMartini 11	2	2600	4 1/2 x 5 1/2	36x4	36x5	W
Armstrong, 20	1	....	3 1/2 x 5 1/2	34x3 1/2	34x5	W	DeMartini 12	2 1/2	2250	4 1/2 x 5 1/2	34x3 1/2	36x5	W
Armstrong, HW	2 1/2	....	4 1/2 x 5 1/2	36x4	36x7	W	DeMartini 13	1 1/2	2600	3 1/2 x 5	34x3 1/2	34x6	W
Armstrong, KW	3 1/2	....	4 1/2 x 6	36x5	36x5 1/2	W	DeMartini 14	3	3300	4 x 5 1/2	36x3 1/2	36x7	W
Atco, B	1 1/2	....	3 1/2 x 5 1/2	34x5 1/2	36x6	I	DeMartini 15	4	4250	4 1/2 x 5 1/2	36x4	36x10	W
Atco, BI	2 1/2	....	3 1/2 x 5 1/2	34x5 1/2	36x6	I	DeMartini 16	1 1/2	4800	4 1/2 x 6	36x5	36x12	W
Atco, A	1 1/2	....	3 1/2 x 5 1/2	36x4	36x8	W	DeMartini 17	3 1/2	1625	3 1/2 x 5	35x5 1/2	35x5 1/2	B
Atlas, M.D.	1	....	3 1/2 x 5	32x4 1/2	32x4 1/2	I	DeMartini 18	1 1/2	2300	3 1/2 x 5	35x5 1/2	35x5 1/2	I
Atterbury, 20R	1 1/2	2775	3 1/2 x 5	34x3 1/2	34x5	W	DeMartini 19	1 1/2	2600	3 1/2 x 5	36x3 1/2	36x6	I
Atterbury, 7CX	3 1/2	3375	4 1/2 x 5 1/2	36x4	36x4 1/2	W	DeMartini 20	3	3300	4 1/2 x 5 1/2	36x4	36x7	I
Atterbury, 7D	3 1/2	4175	4 1/2 x 5 1/2	36x5	40x5 1/2	W	DeMartini 21	4	4200	4 1/2 x 5 1/2	36x5	36x5 1/2	I
Atterbury, 8E	5	5575	4 1/2 x 6	36x5	40x6 1/2	W	DeMartini 22	5	4850	4 1/2 x 5 1/2	36x6	40x6 1/2	I
Autocar, 21UF	1 1/2	2300	4 1/2 x 5 1/2	34x4	34x5	D	DeMartini 23	1 1/2	1650	3 1/2 x 5	34x5	36x6	W
Autocar, 21UG	1 1/2	2400	4 1/2 x 5 1/2	34x4	34x5	D	DeMartini 24	2	2350	3 1/2 x 5	34x3 1/2	34x5	W
Autocar, 26V	....	4350	4 1/2 x 5 1/2	34x5	36x10	D	DeMartini 25	2	2650	4 x 5 1/2	34x5	36x6	W
Autocar, 26-B	....	4500	4 1/2 x 5 1/2	34x5	36x10	D	DeMartini 26	2 1/2	2950	4 1/2 x 5 1/2	36x4	36x7	W
Available, H1 1/2	1 1/2	2475	4 x 5 1/2	36x3 1/2	36x5	W	DeMartini 27	3 1/2	3550	4 1/2 x 6	36x6	38x7	W
Available, H2	2	2775	4 x 5 1/2	36x3 1/2	36x6	W	DeMartini 28	1	2500	3 1/2 x 5 1/2	34x5 1/2	36x6 1/2	W
Available, H2 1/2	2 1/2	3475	4 x 5 1/2	36x4	36x8	W	DeMartini 29	1 1/2	2960	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Available, H3 1/2	3 1/2	4475	4 1/2 x 5 1/2	36x5	40x5 1/2	W	DeMartini 30	1 1/2	2650	3 1/2 x 5 1/2	36x3 1/2	36x5	W
Available, H5	5	5375	4 1/2 x 6	36x6	40x12	W	DeMartini 31	2	3285	4 x 5 1/2	36x4	36x7	W
Available, H7	7	6000	5 x 6	36x6	40x14	B	DeMartini 32	3 1/2	4075	4 1/2 x 5 1/2	36x5	36x5 1/2	W
Avery	1	....	3 x 4	34x5 1/2	34x5 1/2	I	DeMartini 33	5	5400	4 1/2 x 5 1/2	36x6	40x6 1/2	W
Beck, A. Jr.	1	1800	3 1/2 x 5	34x3 1/2	34x4	I	DeMartini 34	5	5650	4 1/2 x 6	36x6	40x6 1/2	W
Beck, C	1	1800	3 1/2 x 5	34x3 1/2	34x4	I	DeMartini 35	5	5650	4 1/2 x 6	36x6	40x6 1/2	W
Beck, M	1	1650	3 1/2 x 5	34x3 1/2	34x4	I	DeMartini 36	1 1/2	....	3 1/2 x 5	36x6	36x6	I
Bell, E	1 1/2	2250	3 1/2 x 5 1/2	34x3 1/2	34x5 1/2	I	DeMartini 37	1 1/2	....	3 1/2 x 5	36x6	36x6	I
Bell, O	2 1/2	2750	4 1/2 x 5 1/2	34x4	34x6	I	DeMartini 38	1	1350	3 1/2 x 5	34x4 1/2	34x4 1/2	I
Belmont, D	2	2675	3 1/2 x 5	34x3 1/2	34x6	D	DeMartini 39	2 1/2	4100	4 1/2 x 5 1/2	36x5	36x7	C
Belmont, F	3 1/2	3525	4 x 6	36x5 1/2	36x5 1/2	D	DeMartini 40	3	5100	4 1/2 x 5 1/2	36x5	36x5 1/2	C
Bessemer, G	1	1395	3 1/2 x 5	35x5 1/2	35x5 1/2	I	DeMartini 41	0	6000	5 x 6 1/2	36x6	40x6 1/2	C
Bessemer, H-2	1 1/2	1995	3 1/2 x 5	36x3 1/2	36x5	I	Dodge Brothers	3	885	3 1/2 x 5	33x4 1/2	33x4 1/2	I
Bessemer, J-2	2 1/2	2595	4 1/2 x 5 1/2	36x4	36x4 1/2	I	Dorris, K-4	2-2 1/2	3400	4 1/2 x 5 1/2	36x4	36x7	W
Bessemer, K-2	4	3495	4 1/2 x 5 1/2	36x5	36x10	I	Dorris, K-7	3 1/2	4400	4 1/2 x 5 1/2	36x5	36x10	W
Bethlehem, K	1	....	3 1/2 x 5	34x4 1/2	35x5	I	Double Drive B	3	4000	4 1/2 x 5 1/2	6	6	W
Bethlehem, G	2	....	4 x 5 1/2	34x3 1/2	34x6	I	Douglas G	1 1/2	2050	3 1/2 x 5 1/2	36x5	37x8	W
Bethlehem, H	3	....	4 x 5 1/2	36x4	36x8	I	Douglas I	1 1/2	3250	4 1/2 x 5 1/2	36x6	37x8	W
Bethlehem, J	4	....	4 1/2 x 5 1/2	36x5	36x5 1/2	I	Duplex, A	1 1/2	2775	4 x 5 1/2	35x5 1/2	38x7 1/2	W
Bollstrom, 30	1 1/2	2100	3 1/2 x 5 1/2	34x3 1/2	34x6	I	Duplex, E	2 1/2	4250	4 1/2 x 5 1/2	36x8	36x8	I
Bollstrom, 50	2 1/2	2800	4 1/2 x 5 1/2	36x4	36x8	I	Duty, 21	2	1490	3 1/2 x 5	34x3 1/2	34x5	I
Bollstrom, 70	3 1/2	3800	4 1/2 x 6	36x5	36x10	I	Eagle, 100-2	2	2275	3 1/2 x 5	34x4	34x7	I
Bollstrom, A-20	4	6000	5 1/2 x 7	40x8 1/2	40x8 1/2	I	Erie, E	1 1/2	....	3 1/2 x 5 1/2	36x6 1/2	36x6 1/2	W
Bollstrom, B21	4	5050	4 1/2 x 5 1/2	36x7	36x7	W	Erie, A	2 1/2	....	4 1/2 x 5 1/2	36x4	36x4 1/2	W
Bridgeport, A	1 1/2	2350	3 1/2 x 5 1/2	34x3	34x6	W	F.W.D., B	5	4200	4 1/2 x 5 1/2	36x6	36x6	B
Bridgeport, B	2 1/2	2850	4 1/2 x 5 1/2	36x4	36x7	W	Facto, 1921	2 1/2	2895	4 1/2 x 5 1/2	36x4	36x8	W
Bridgeport, C	3 1/2	3850	4 1/2 x 6	36x5	36x5 1/2	W	Fageol, 1 1/2	1 1/2	3000	3 1/2 x 5 1/2	34x3 1/2	34x6	W
Brinton, F	2 1/2	3400	4 1/2 x 5 1/2	36x4</									

## Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Ton Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Ton Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive	NAME AND MODEL	Ton Capacity	Chassis Price	Bore and Stroke	TIRES	Final Drive
				Front Rear						Front Rear						Front Rear	
Kelly-S, K-15	4	\$4550	4 1/2 x 6 1/2	36x5 36x5	40x6d C	Ogden, E	2 1/2	\$3250	4 1/2 x 5 1/2	36x4 36x7	W	Service, 76	3 1/2	\$4485	4 1/2 x 6	36x5 36x5d	W
Kelly-S, K-50	5	4900	4 1/2 x 6 1/2	36x6 36x6	40x6d C	Old Hickory, W	1	2175	3 3/4 x 5	36x3 1/2 36x4	W	Service, 161	5	5275	4 1/2 x 6	36x6 40x6d	W
Key-S, K-60	6	5100	4 1/2 x 6 1/2	36x6 36x6	40x7d C	Old Reliable, A	1 1/2	2350	4 x 5	34x4 36x6	W	Signal, NF	1	2475	4 1/2 x 5	34x5 36x6	W
Keystone, 40	2	2450	3 3/4 x 5 1/2	34x5 38x7 1/2	I	Old Reliable, B	2 1/2	3500	4 1/2 x 6	34x4 36x4d	W	Signal, H	1 1/2	2925	4 1/2 x 5 1/2	34x4 36x6	W
Kimball, AB	2	3675	4 x 6	36x4 36x7	W	Old Reliable, C	3 1/2	4250	4 1/2 x 6	36x5 36x5d	W	Signal, J	2 1/2	3275	4 1/2 x 5 1/2	34x4 36x8	W
Kimball, AC	2 1/2	3675	4 1/2 x 6	36x4 36x8	W	Old Reliable, D	5	5250	4 1/2 x 6	36x6 40x6d	W	Signal, M	3 1/2	4275	4 1/2 x 5 1/2	36x5 40x5d	W
Kimball, AK	3	4500	4 1/2 x 6	36x4 36x10	W	Old Reliable, KLM	7	6000	4 1/2 x 6 1/2	36x6 40x7d	C	Signal, R	5	5300	4 1/2 x 6	36x6 40x6d	W
Kimball, AE	4	5000	4 1/2 x 6	36x5 40x12	W	Oldsmobile Econ.	1	1250	3 1/2 x 5 1/2	35x5 35x5 1/2	I	Southern, 10	1	2090	3 1/2 x 5	34x3 1/2 34x4	W
Kimball, AF	4	5975	5 x 6	36x6 40x7d	W	Olympic, A	2 1/2	3500	4 1/2 x 5 1/2	36x4 36x7	W	Southern, 15	1 1/2	2590	3 1/2 x 5 1/2	36x6 34x4	W
Kissel, Express	1 1/2	1985 1/2	3 1/2 x 5 1/2	34x5 34x5 1/2	W	Oneida, A-9	1 1/2	2350	3 3/4 x 5 1/2	36x3 1/2 36x5	W	Southern, 20	2	2990	3 1/2 x 5 1/2	36x6 40x8	W
Kissel, Utility	1 1/2	2775	3 3/4 x 5 1/2	36x3 1/2 36x5	W	Oneida, B-9	1 1/2	2915	4 x 5 1/2	36x4 36x7	W	Standard, 1-K	1-1 1/2	1950	3 3/4 x 5 1/2	34x3 1/2 34x5	W
Kissel, Freight	2 1/2	3475	4 1/2 x 5 1/2	36x4 36x7	W	Oneida, C-9	2 1/2	3300	4 x 5 1/2	36x4 36x7	W	Standard, 76	2 1/2	3100	4 1/2 x 5 1/2	36x4 36x7	W
Kissel, H. D.	4	4475	4 1/2 x 5 1/2	36x5 36x5d	W	Oneida, D-9	3 1/2	4345	4 1/2 x 5 1/2	36x5 36x10	W	Standard, 6-K	3 1/2-4	4000	4 1/2 x 5 1/2	36x5 36x10	W
Kleiber, A	1	2600	4 1/2 x 5 1/2	34x3 1/2 34x5	W	Oneida, E-9	5	5460	4 1/2 x 5 1/2	36x6 40x12	W	Standard, 5-K	5-7	5250	4 1/2 x 6	36x6 40x12	W
Kleiber, A	1 1/2	3100	4 1/2 x 5 1/2	36x3 1/2 36x6	W	Orleans, A	1 1/2	2750	3 3/4 x 5 1/2	36x3 1/2 36x5	W	Sterling, 1 1/2	1 1/2	3200	4 x 5 1/2	36x3 1/2 36x5	W
Kleiber, BB	2	3600	4 1/2 x 5 1/2	36x4 36x7	W	Orleans, B	2 1/2	3250	4 1/2 x 5 1/2	36x4 36x7	W	Sterling, 2	2	3500	4 x 5 1/2	36x4 36x6	W
Kleiber, B	2 1/2	3950	4 1/2 x 5 1/2	36x5 36x8	W	Orleans, C	3 1/2	3750	4 1/2 x 5 1/2	36x4 36x8	W	Sterling, 2 1/2	2 1/2	3650	4 1/2 x 5 1/2	36x4 36x4d	W
Kleiber, C	3	4600	4 1/2 x 5 1/2	36x5 36x5d	W	Orleans, D	5	4250	4 1/2 x 5 1/2	36x6 40x8	W	Sterling, 3 1/2	3 1/2	4650	4 1/2 x 5 1/2	36x5 40x5d	W
Kleiber, D	5	5300	5 x 6 1/2	36x6 40x12	W	Oshkosh, A	2	3750	3 1/2 x 5	36x6 36x6 1/2	4	Sterling, 5-C	5	5500	5 x 6 1/2	36x6 40x6d	C
Kochler, D	1 1/2	1885	3 1/2 x 5	34x3 1/2 34x5	W	Oshkosh, AA	2	3850	3 1/2 x 5	36x6 36x6 1/2	4	Sterling, 5-W	5	6000	5 x 6 1/2	36x6 40x6d	C
Kochler, M	2 1/2	2875	4 x 5 1/2	36x4 36x7	W	Oshkosh, B	2 1/2	4150	4 x 5 1/2	38x7 38x7 1/2	4	Sterling, 7 1/2	7 1/2	6500	5 x 6 1/2	36x6 40x7d	C
Kochler, MCS	2 1/2	2975	4 x 5 1/2	36x4 36x7	W	Oshkosh, BB	2 1/2	4300	4 x 5 1/2	38x7 38x7 1/2	4	Stewart, 14	3 1/2	1395	3 1/2 x 5 1/2	32x4 1/2 32x4 1/2	I
Kochler, F	2 1/2	3945	4 1/2 x 5 1/2	36x5 36x10	W	Packard, EC	...	3500	4 1/2 x 5 1/2	36x4 36x7	W	Stewart, 15	1	1875	3 1/2 x 5	35x5 35x5 1/2	I
Kochler, MT, Trac.	2 1/2	2975	4 x 5 1/2	36x4 36x7	W	Packard, ED	...	4100	4 1/2 x 5 1/2	36x5 36x5d	W	Stewart, 9	1 1/2	2200	3 1/2 x 5	34x3 1/2 34x5	I
L.M.C., 2-20	2 1/2	2540	4 1/2 x 5 1/2	36x4 36x4d	I	Packard, EF	...	4500	5 x 5 1/2	36x6 40x6d	W	Stewart, 7	2	2800	4 1/2 x 5 1/2	34x4 34x7	I
Lange, B	2 1/2	3350	4 1/2 x 5 1/2	36x4 36x6	C	Packard, EX	...	4000	4 1/2 x 5 1/2	36x6 40x8 1/2	W	Stewart, 7-X	2 1/2	2950	4 1/2 x 5 1/2	34x4 34x7	I
Larrabee, XZ	3 1/2-4	1925	3 1/2 x 4 1/2	34x5 34x5 1/2	B	Paige, 52-19	1 1/2	2880	4 x 5 1/2	34x3 1/2 34x5	W	Stewart, 10	3 1/2	3850	4 1/2 x 5 1/2	36x5 36x5d	I
Larrabee, U	1	2400	3 1/2 x 4 1/2	34x3 1/2 34x5	W	Paige, 54-20	2 1/2	3400	4 1/2 x 5 1/2	34x4 34x8	W	Stewart, 10-X	3 1/2	3850	4 1/2 x 5 1/2	36x5 36x5d	I
Larrabee, SK	2 1/2	3200	4 1/2 x 5 1/2	36x4 36x7	W	Paige, 51-18	3 1/2	4255	4 1/2 x 5 1/2	36x5 36x5d	W	Stoughton, A	1	1995	3 3/4 x 5 1/2	34x4 1/2 35x5 1/2	W
Larrabee, FL	2 1/2	4000	4 1/2 x 5 1/2	36x5 36x5d	W	Parker, F20	2	3500	4 x 6	34x4 36x4d	W	Stoughton, B	1 1/2	2350	3 3/4 x 5 1/2	36x5 36x5	W
Larrabee, FW	5	4900	4 1/2 x 6	36x6 40x6d	W	Parker, J20	3 1/2	4400	4 1/2 x 6	36x5 40x5d	W	Stoughton, D	2	2800	4 x 5 1/2	36x4 36x7	W
Lion, L	1	2350	3 1/2 x 5 1/2	35x5 35x5 1/2	W	Parker, M20	5	5500	4 1/2 x 6	36x6 40x6d	W	Stoughton, F	3	3600	4 1/2 x 5 1/2	36x5d 36x5d	W
Luedinghaus, C	1	2100	3 1/2 x 5	35x5 35x5 1/2	W	Patrol, Reverse	...	1755	3 3/4 x 5	35x5 35x5 1/2	W	Sullivan, E	2	3350	4 1/2 x 5 1/2	36x4 36x7	W
Luedinghaus, W	1 1/2	2700	3 3/4 x 5 1/2	34x3 1/2 34x5	W	Patrol, Lincoln	1 1/2	2450	4 x 5 1/2	34x3 1/2 34x5	W	Sullivan, H	3 1/2	4650	4 1/2 x 6	36x5 36x5d	W
Luedinghaus, W	2-2 1/2	3150	4 1/2 x 5 1/2	36x4 36x7	W	Patrol, Wash't'n	2 1/2	3450	4 1/2 x 5 1/2	36x4 36x7	W	Superior, D	1	1650	3 3/4 x 5	34x4 1/2 34x4	I
Maccari, L	1 1/2	2925	4 1/2 x 5 1/2	36x4 36x6	W	Piedmont, 4-30	1 1/2	1685	3 1/2 x 5	34x4 34x4 1/2	W	Superior, E	2	2600	4 1/2 x 5 1/2	36x4 36x6	I
Maccari, H-2	1 1/2	3650	4 1/2 x 5 1/2	36x4 36x4d	W	Pierce-Arrow	2	3200	4 x 5 1/2	36x4 36x4d	W	Super Truck, 50	2 1/2	3300	4 x 6	36x4 36x8	W
Maccari, M-2	3 1/2	4500	4 1/2 x 6	36x5 36x5d	W	Pierce-Arrow	3 1/2	4350	4 1/2 x 6 1/2	36x5 36x5d	W	Super Truck, 70	3 1/2	4300	4 1/2 x 6	36x5 40x5d	W
Maccari, G	5	5500	4 1/2 x 6	36x5 40x6d	W	Pierce-Arrow	5	4850	4 1/2 x 6 1/2	36x5 40x6d	W	Super Truck, 100	5	5300	4 1/2 x 6	36x5 40x12	W
MacDonald, A	2 1/2	5750	4 1/2 x 6	40x7 40x14	I	Pioneer, 52	1	1550	3 1/2 x 4 1/2	32x4 1/2 32x4 1/2	W	Super Truck, 150	5	6300	5 x 6	36x6 40x7d	W
Mack, AB D.R.	1 1/2	3450	4 x 5	36x4 36x4d	D	Pittsburger, C-21	2 1/2-3	3500	4 1/2 x 5 1/2	36x5 36x7	W	Texas, A38	1 1/2	1095	3 1/2 x 5	33x4 33x4	I
Mack, AB	1 1/2	3400	4 x 5	36x4 36x4d	C	Pony	...	400	2 3/4 x 4	28x3 28x3 1/2	C	Texas, TK39	1 1/2	1550	3 1/2 x 5	36x6 38x7	W
Mack, AB Chain	1 1/2	3000	4 x 5	36x4 36x3 1/2	C	Power, F	1 1/2	...	3 3/4 x 5 1/2	36x6 36x6	W	Tiffin, GW	1 1/2	2400	4 1/2 x 5 1/2	36x3 1/2 36x5	W
Mack, AB Chain	2	3300	4 x 5	36x4 36x4d	C	Power, C	3 1/2	...	4 1/2 x 5 1/2	36x5 40x10	W	Tiffin, MW	2 1/2	3100	4 1/2 x 5 1/2	36x4 26x3 1/2	I
Mack, AB D.R.	2	3750	4 x 5	36x4 36x4d	D	Premocar, B-143	1 1/2	2475	3 1/2 x 5	36x6 36x6 1/2	W	Tiffin, PW	3 1/2	4100	4 1/2 x 5 1/2	36x5 40x5d	W
Mack, AC Chain	3 1/2	4950	5 x 6	36x5 40x5d	C	Rainier, R-11	1 1/2	2150	3 1/2 x 5	35x5 35x5 1/2	W	Tiffin, F50	5	4800	4 1/2 x 6	36x6 40x6d	W
Mack, AC Chain	5	5500	5 x 6	36x6 40x6d	C	Rainier, R-19	1	2350	3 1/2 x 5	34x3 1/2 34x4	W	Tiffin, F60	6	5000	4 1/2 x 6	36x6 40x12	W
Mack, AC Chain	6 1/2	5750	5 x 6	36x6 40x12	C	Rainier, R-16	1 1/2	2600	3 1/2 x 5	34x3 1/2 34x5	W	Titan, HT	3 1/2	4550	4 1/2 x 6	34x4 40x5d	I
Mack, AC Chain	7 1/2	6004	5 x 6	36x7 40x7d	C	Rainier, R-18	2	2950	4 1/2 x 5 1/2	34x4 34x6	W	Titan, HD	5	5400	4 1/2 x 6	36x5 40x6d	I
Mack Trac, AB	5	3406	4 x 5	36x4 36x4d	C	Rainier, R20	2 1/2	3600	4 1/2 x 5 1/2	34x4 34x7	W	Titan, TS	2 1/2	3400	4 1/2 x 5 1/2	34x4 36x4d	I
Mack Trac, AC	7	4950	5 x 6	36x5 40x5d	C	Rainier, R-15	3 1/2	4503	4 1/2 x 5 1/2	36x5 36x5d	W	Tower, J	1 1/2	3000	4 1/2 x 5 1/2	35x5 38x7	W
Mack Trac, AC	10	5500	5 x 6	36x6 40x6d	C	Rainier, R17	6	5250	4 1/2 x 6	36x6 36x6d	W	Tower, H	2 1/2	3475	4 1/2 x 5 1/2	36x4 36x7	W
Mack Trac, AC	15	5750	5 x 6	36x6 40x12	C	Ranger, TK-26-2	2	1855	4 1/2 x 5 1/2	36x6 36x6 1/2	W	Traffic, G	2 1/2	4400	4 1/2 x 5 1/2	36x5 36x5d	W
Mack Trac, AC	20	6000	5 x 6	36x7 40x7d	C	Reo, C	2 1/2-11	1885	4 1/2 x 5 1/2	34x4 34x4 1/2	I	Traffic, C	3	1505	3 1/2 x 5	34x3 1/2 34x5	I
Mapleleaf, AA**	2	4150	4 x 5 1/2	36x4 36x7	W	Reliance, 10A	1 1/2	2400	4 x 5 1/2	36x3 1/2 36x5	I	Traffic, C	3	1895	3 1/2 x 5	36x4 36x7	I
Mapleleaf, BB**	3	4775	4 1/2 x 5 1/2	36x4 36x4d	W	Reliance, 20B	1 1/2	3100	4 1/2 x 5 1/2	36x4 36x4d	I	Transport, 20	1	1395	3 1/2 x 5 1/2	34x3 1/2 34x4	I
Mapleleaf, CC**	4	5770	4 1/2 x 5 1/2	36x5 36x5d	W	Republic, 75	1 1/2	1395 1/2	3 1/2 x 5	32x4 1/2 32x4 1/2	I	Transport, 30	1 1/2	1995	3 1/2 x 5	36x3 1/2 36x5	I
Mapleleaf, DD**	5	6825	4 1/2 x 5 1/2	36x6 40x6d	W	Republic, 10	1	1695	3 1/2 x 5	35x5 35x5 1/2	I	Transport, 50	2 1/2	2785	4 1/2 x 5 1/2	36x4 36x7	I
Master, JW	1 1/2	2600	4 1/2 x 5 1/2	34x3 1/2 34x5	W	Republic, 10Exp. 11	1	2095	3 1/2 x 5	35x5 35x5 1/2	I	Transport, 70	3 1/2	3885	4 1/2 x 6	36x5 36x10	I
Master, W	2 1/2	3290	4 1/2 x 5 1/2	34x4 36x7	W	Republic, 11X	1 1/2	2295	3 1/2 x 5	34x3 1/2 34x5	I	Traylor, B	1 1/2	2390	3 1/2 x 5 1/2	34x3 1/2 34x5	W
Master, D	2 1/2	3540	4 1/2 x 5 1/2	34x4 36x7	D	Republic, 19	2 1/2	2795	4 1/2 x 5 1/2	36x4 36x7	I	Traylor, C	2	2850	4 x 5 1/2	36x4 36x7	W
Master, A	3 1/2	4190	4 1/2 x														



## Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive	NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES		Final Drive					
				Front	Rear						Front	Rear						Front	Rear						
Watson, B	1	\$1865	3 1/2 x 5 1/4	35x5 1/2	35x5 1/2	W	Wichita, S	5	\$5000	4 1/2 x 6	36x6	40x6d	W	Winther, 39	1 1/2	\$2450	3 1/2 x 5	34x3 1/2	34x5	I					
Watson, N	3 1/2	4250	4 1/2 x 5 1/4	36x5	36x10	W	Wilcox, AA	1	2100	3 1/2 x 5 1/2	36x4	36x4	W	Winther, 49	2	3250	4 x 5	34x4	34x4d	I					
Western, W1 1/2	1 1/2	2550	4 1/2 x 5 1/4	36x3 1/2	36x5	W	Wilcox, B	1 1/2	2775	4 1/2 x 5	36x4	36x5	W	Winther, 50	2 1/2	3995	4 x 6	38x7 1/2	42x9 1/2	I					
Western, W1 1/2	1 1/2	2550	3 1/2 x 5	36x3 1/2	36x5	W	Wilcox, D	2 1/2	3300	4 1/2 x 5	36x4	36x3 1/2	W	Winther, 70	3 1/2	4200	4 x 6	36x5	36x5d	I					
Western, W2 1/2	2 1/2	3250	4 1/2 x 5 1/4	36x4	36x7	W	Wilcox, E	3 1/2	4250	4 1/2 x 6	36x5	36x5d	W	Winther, 450	2 1/2	3690	4 x 5	34x5	36x6	I					
Western, W2 1/2	2 1/2	3250	4 1/2 x 6	36x4	36x7	W	Wilcox, F	5	5200	4 1/2 x 6 1/2	36x5	40x6d	W	Winther, 109	5	5250	4 1/2 x 6	36x6	40x5d	I					
Western, W3 1/2	3 1/2	4250	4 1/2 x 6	36x5	40x5d	W	Wilson, F	1 1/2	2270	3 1/2 x 5	36x3 1/2	36x5	W	Winther, 140	7	5900	5 x 6	36x6	40x7d	I					
White, 15	3 1/2	2400	3 1/2 x 5 1/4	34x5 1/2	34x5 1/2	B	Wilson, EA	2 1/2	2825	4 1/2 x 5 1/4	36x4	36x7	W	Wisconsin B	1	1950	4 x 5 1/2	34x5 1/2	34x5 1/2	W					
White, 20	2	3250	3 1/2 x 5 1/4	36x4	36x7	D	Wilson, G	3 1/2	3685	4 1/2 x 5 1/4	36x5	36x5d	W	Wisconsin C	1 1/2	2500	4 1/2 x 5 1/4	36x6 1/2	36x6 1/2	W					
White, 40	3 1/2	4200	3 1/2 x 5 1/4	36x5	40x5d	D	Wilson, H	5	4520	4 1/2 x 6	36x6	40x6d	W	Wisconsin D	2 1/2	3500	4 1/2 x 5 1/4	36x6	36x10	W					
White, 45	5	4500	4 1/2 x 5 1/4	36x6	40x6d	D	Winther, 751	1	1795	3 1/2 x 5	34x4 1/2	35x5 1/2	I	Wisconsin E	3 1/2	4000	5 x 6 1/2	36x6 1/2	36x12 1/2	W					
White Hick., E	1	2450	3 1/2 x 5	34x5 1/2	34x5 1/2	W	Winther, 430	1 1/2	2850	3 1/2 x 5	32x4	32x4	I	Witt-Will, P	1 1/2	2750	3 1/2 x 5	36x3 1/2	36x5	W					
White Hick., H	1 1/2	2750	3 1/2 x 5 1/4	36x3 1/2	36x5	W	*2-cyl. 16-cyl. 18-cyl. All others, not marked. are 4-cyl. Trac., Tractor. **Canadian made. Final Drive: W—Worm, I—Internal Gear. C—Chain, D—Double Reduction, B—Bevel, 4— Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price in- cludes body. ‡—Price includes several items of equipment.												Witt-Will, P	2 1/2	3250	4 1/2 x 5 1/4	36x3 1/2	36x7	W
White Hick., K	2 1/2	3350	4 1/2 x 5 1/4	36x4	36x5	W								Wolverine, J	1	2125	3 1/2 x 5	34x3 1/2	34x4	I					
Wichita, K	1	2300	3 1/2 x 5 1/4	36x3 1/2	36x4	W								Wolverine, J	1 1/2	2375	3 1/2 x 5	34x3 1/2	34x5	I					
Wichita, L	1 1/2	2600	3 1/2 x 5 1/4	36x3 1/2	36x5	W								Wolverine, J	2	2640	3 1/2 x 5	34x4	34x7	I					
Wichita, M	2	2800	3 1/2 x 5 1/4	36x3 1/2	36x6	W								Wolverine, J	2 1/2	3125	4 1/2 x 5 1/4	36x5	36x10	I					
Wichita, R	2 1/2	3000	3 1/2 x 5 1/4	36x4	36x7	W								Wolverine, L	3 1/2	4100	4 1/2 x 5 1/4	36x5	36x10	I					
Wichita, RX	2 1/2	3600	4 1/2 x 6	36x4	36x5	W								Yellow Cab M21	3 1/2	2050	3 1/2 x 5	32x4	32x4	B					
Wichita, O	3 1/2	4000	4 1/2 x 6	36x5	36x5d	W								Yellow Cab M41	3 1/2	2350	3 1/2 x 5	34x4 1/2	34x4 1/2	I					

## Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity	
All-In One	16-30	\$1975	3	Clim.	4-5 x 6 1/4	GDK	3-4	Gray, 1920	18-36	\$2000	3	Wauk	4-4 1/2 x 6 1/2	Gas.	4	Port Huron, A	12-25	\$1700	4	Chief	4-4 1/2 x 6	G.K	3	
Allis-Chalm. B	6-12	925	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Ground Hog	19-31	2000	4	Erd.	4-4 x 6	GorK	3	Post, D	12-20	1800	4	Wauk	4-4 1/2 x 5 1/2	GorK	2	
Allis-Chalm. G.P.	6-12	850	2	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	Gt. Western St	20-30	1950	4	Beav.	4-4 1/2 x 6	K.	4	Prairie Dog, L	9-18	650	3	Wauk	4-3 1/2 x 5 1/2	Gas.	2	
Allis-Chalm.	12-20	1495	2	Mid. W	4-4 1/2 x 5 1/2	Gas.	2-3									Prairie Dog, D	15-30	1250	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3	
Allis-Chalm.	18-30	2150	4	Own	4-4 1/2 x 6 1/2	GorK	3-4	Hart-Parr, 20	20	995	4	Own	2-5 1/2 x 6 1/2	K.D	3	Ranger Cul.	8-16	.....	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	
Allis-Chalm.	10-18	875	4	Own	4-4 1/2 x 5 1/2	G.K.	4	Hart-Parr, 30	30	1595	4	Own	2-6 1/2 x 7	K.D	3	T-20	8-16	.....	4	Dom	4-4 1/2 x 6	K.	3-4	
Allwork, 2-G	14-28	1875	4	Own	4-4 1/2 x 6 1/2	GorK	3	Heider, C	9-16	1170	4	Wauk	4-4 1/2 x 5 1/2	G.K	12	Reed, A-J	15-30	2750	4	Dom	4-5 x 6	Gas.	4	
Allwork, C	14-28	1675	4	Own	4-5 x 6	GorK	3	Heider, D	12-20	1395	4	Wauk	4-4 1/2 x 6 1/2	G.K	12	Reed, A-J	18-36	2400	4	Dom	4-5 x 6	Gas.	4	
Andrews-Kin.D	18-36	2500	4	Clim.	4-5 x 6 1/2	GorK	4	Heider, Cult	6-10	1050	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1	Reliable, A	10-20	985	4	Own	2-6 x 7	Ker.	2	
Appleton	12-20	1500	4	Buda	4-4 1/2 x 5 1/2	G.K.	2-3	Hicks, C	20-30	.....	4	LeR.	4-4 1/2 x 6	GorK	1	Reliable, B	12-25	1600	4	Wauk	4-4 1/2 x 5 1/2	GorK	3	
Aro, 1921	3-5	550	4	Own	1-4 1/2 x 5 1/2	Gas.	1	Huber Light 4	12-25	1185	4	Wauk	4-4 1/2 x 5 1/2	GorK	3	Russell, C	12-24	1500	4	Own	4-4 1/2 x 5 1/2	GorK	2-3	
Aultman-T.	15-30	2200	4	Clim.	4-5 x 6 1/2	G.K.	4	Huber Super 4	15-30	1885	4	Mid. W	4-4 1/2 x 6	Gas.	3	Russell, D	15-30	2200	4	Own	4-5 x 6 1/2	GorK	3-4	
Aultman-T.	22-45	3850	4	Own	4-5 1/2 x 6 1/2	G.K.	6									Russell, E	20-35	3000	4	Own	4-5 1/2 x 7	GorK	4-5	
Aultman-T.	30-60	5000	4	Own	4-7 x 9	G.K.D	8	Illinois, Super	18-36	2375	4	Clim.	4-5 x 6 1/2	G.K	4	Samsen, M	30-60	5000	4	Own	4-8 x 10	GorK	8-10	
Automot. B-3.	12-24	1785	4	Herc.	4-4 x 5 1/2	Gas.	2-3	Imperial, C	40-70	5000	4	Own	4-7 1/2 x 9	G.K.D	10	Sandusky, J	10-20	795	4	Nov.	4-4 x 5 1/2	G.K	2	
Avery, SR, Cul	5-10	.....	3	Own	4-3 x 4	G.K.	2	Imperial, E	40-70	5000	4	Own	4-7 1/2 x 9	G.K.D	10	Sandusky, J	10-20	795	4	Nov.	4-4 x 5 1/2	G.K	2	
Avery, Cult-C	5-10	.....	3	Own	4-3 x 4	G.K.	2	Indiana, F	5-10	895	2	LeR.	4-3 1/2 x 4 1/2	G.K	1-2	Sandusky, E	15-35	1750	4	Own	4-5 x 6 1/2	G.K.D	4	
Avery, B	5-10	.....	4	Own	4-3 x 4	G.K.	2	International	8-16	900	4	Own	4-4 1/2 x 5	G.K.D	2	Shawnee Com.	6-12	.....	2	LeR.	4-3 1/2 x 4 1/2	Gas.	10	
Avery, C	5-10	.....	4	Own	4-3 x 4	G.K.	2	International	15-30	1750	4	Own	4-4 1/2 x 5	G.K.D	4	Shawnee Com.	9-18	.....	2	Gray	4-3 1/2 x 4 1/2	.....	..	
Avery, C	8-16	.....	4	Own	2-5 1/2 x 6	G.K.D	2-3	J-T, N	20-40	3485	*2	Chief	4-4 1/2 x 6	G.K.D	3-4	Shelby, D	15-30	.....	4	Beav.	4-4 1/2 x 6	G.K	3	
Avery, C	12-20	.....	4	Own	2-6 1/2 x 7	G.K.D	3-4	Klumb, F	16-32	1650	4	Clim.	4-5 x 6 1/2	G.K	4	Shelby, C	10-20	.....	4	Erd.	4-4 x 6	GorK	2-3	
Avery, C	12-25	.....	4	Own	2-6 1/2 x 7	G.K.D	3-4	Knudson, 1920	25-45	2500	4	Own	4-5 x 9	Gas	4-6	Short Turn, A	20-40	1500	3	Beav.	4-4 1/2 x 6	G.K	3	
Avery, C	14-28	.....	4	Own	4-4 1/2 x 7	G.K.D	4-5	LaCrosse, M	6-12	650	4	Own	2-4 x 6	O.K	1	Square T, A	18-35	2025	3	Clim.	4-5 x 6 1/2	K.G	3	
Avery, C	18-36	.....	4	Own	4-5 1/2 x 7	G.K.D	4-5	LaCrosse, G	12-24	985	4	Own	2-6 x 7	GorK	3	Steady Pull, A	12-24	1485	4	Own	4-4 x 5	Gas.	3	
Avery, C	25-50	.....	4	Own	4-6 1/2 x 7	G.H.D	5-6	Lauson, 21	12-24	1485	4	Mid. W	4-4 1/2 x 5 1/2	GorK	3-4	Stone, 4E	18-36	1835	4	Beav.	4-4 1/2 x 6	G.K	4	
Avery, C	45-65	.....	4	Own	4-7 1/2 x 8	G.K.D	5-10	Lauson, 21	12-24	1485	4	Mid. W	4-4 1/2 x 5 1/2	GorK	3-4	Stone, 4E	20-40	2250	4	Beav.	4-4 1/2 x 6	G.K	1	
Bates, 15-25	.....	.....	4	Own	4-4 1/2 x 6	Ker.	3	Leader, 21	15-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Tiga, 3	15-27	2625	4	Wiso.	2-4 1/2 x 6	Gas.	3-4	
Bates Mule, H	15-25	.....	4	Mid. W	4-4 1/2 x 5 1/2	Gas.	3	Leader, 21	15-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3-4	Tiga, 3	15-27	2625	4	Wiso.	2-4 1/2 x 6	Gas.	3-4	
Bates Mule, F	18-25	.....	*2	Mid. W	4-4 1/2 x 6	Gas.	3	Leader, B	12-18	1095	4	Own	2-6 x 6 1/2	G.K.D	3	Topp, B	30-45	3500	4	Wauk	4-4 1/2 x 6 1/2	Gas.	3-4	
Bates Mule, G	25-35	.....	*2	Mid. W	4-4 1/2 x 6	Gas.	com.	Leader, N	16-32	1985	4	Clim.	4-5 x 6 1/2	G.K	3-4	Toro Cultivator	6-10	.....	3	LeR.	4-3 1/2 x 4 1/2	Gas.	2	
Bean, 8-16	.....	.....	*1	Own	4-3 1/2 x 4	G.K.	2-3	Leader, GU	18-35	2775	*2	Clim.	4-5 1/2 x 6 1/2	G.K	3-4	Toro Cultivator	6-10	.....	3	LeR.	4-3 1/2 x 4 1/2	Gas.	2	
Beeman, G	2-4	315	4	Own	1-3 1/2 x 4 1/2	Gas.	1/2	Leonard, E	20-30	2530	4	Buda	4-4 1/2 x 6	G.K	3	Townsend, D	10-20	1200	2	Own	4-6 1/2 x 7	Ker	2-3	
Best, 30	.....	.....	*2	Own	4-4 1/2 x 6 1/2	G.K.D	4	Liberty, A	18-32	2475	4	Clim.	4-5 x 6 1/2	G.K	3	Townsend, E	15-30	1800	2	Own	4-7 x 8	Ker	3-4	
Best, 60	.....	.....	*2	Own	4-6 1/2 x 8 1/2	G.K.D	8-9	Linn, HAJ	40	4500	4	Cont.	4-4 1/2 x 5 1/2	Gas.	6	Townsend, F	25-50	3000	2	Own	4-8 1/2 x 10	Ker	4-8	
Boring, 1921	18-36	1850	3	Wauk	4-4 1/2 x 6 1/2	GorK	4	Linn, W	60	5100	4	Wauk	4-5 x 6 1/2	Gas.	6	Traction Motor	40-50	.....	4	.....	8-3 1/2 x 10	Gas.	4-5	
Burn-Oil, 1921	15-30	1650	4	Own	2-6 1/2 x 7	Ker.	3-4	Little Giant, B	16-22	2200	4	Own	4-4 1/2 x 5	K.	4	Traylor, TB	6-12	715	4	LeR.	4-3 1/2 x 4 1/2	Gas.	1-2	
Capital, 15-30	.....	.....	2	Own	4-4 1/2 x 6	Gas.	3	Little Giant, A	16-22	3300	4	Own	4-5 1/2 x 6	K.	6	Triumph, H	18-36	2450	2	Erd.	4-4 1/2 x 6	Ker.	4	
Case, 10-18	.....	.....	2	Own	4-4 1/2 x 6	GorK	2	Lombard, 50	85-150	.....	*2	.....	6-5 1/2 x 6 1/2	Gas.	16	Trundaar, 10	25-40	3750	*2	Wauk	4-5 x 6 1/2	GorK	4	
Case, 15-27	.....	.....	4	Own	4-4 1/2 x 6	GorK	3	Lombard, 50	85-150	.....	*2	.....	6-5 1/2 x 6 1/2	Gas.	16	Trundaar, 10	25-40	3750	*2	Wauk	4-5 x 6 1/2	GorK	4	
Case, 22-40	.....	.....	4	Own	4-5 1/2 x 6 1/2	GorK	4-5	Magnet, B	14-28	1875	4	Wauk	4-4 1/2 x 6 1/2	K&G	3	Turner, 1921	14-25	1295	4	Buda	4-4 1/2 x 6 1/2	G.K	3	
Caterpillar T11	25	4250	*2	Own	4-4 1/2 x 6	Gas.	4	Master Jr	5-10	585	2	LeR.	1-2 1/2 x 4	Gas.	1	Twin City, 1921	12-20	1580	4	Own	4-4 1/2 x 6	G.K	3	
Caterpillar T16	40	6500	*2	Own	4-6 1/2 x 7	Gas.	6	Merry Gar1921	2	230	2	Evlin	1-2 1/2 x 4 1/2	Gas.	1	Twin City, 1921	20-35	3175	4	Own	4-5 1/2 x 6 1/2	G.K	5	
Centaur, 5-2 1/2	455	2	NWay	2-4 1/2 x 4 1/2	GorK	1-9	Minne	All-P	12-25	1200	4	Own	4-4 1/2 x 7	GorK	3	Twin City, 1921	40-65	5250	4	Own	4-7 1/2 x 9	G.K	8	
Chase, 12-25	1725	3	Buda	4-4 1/2 x 5 1/2	GorK	2-3	Minne, Gen-P	17-30	1850	4	Own	4-4 1/2 x 7	GorK	3-4	Uncle Sam C20	12-20	1385	4	Weid.	4-4 x 5 1/2	G	2-3		
Chicago, 40	2500	4	Own	4-4 1/2 x 6	Gas.	4	Minne.	Med.Duty	22-44	3300	4	Own	4-6 x 7	GorK	5-6	Uncle Sam B19	20-30	2300	4	Beav.	4-4 1/2 x 6	GorK	3-4	
Cletrac, W	12-20	1495	*2	Own	4-4 x 5 1/2	G.K.D	2-3	Minne.	HeavyDuty	35-70	4600	4	Own	4-7 1/2 x 9	GorK	8-9	Uncle Sam D21	20-30	1985	4	Beav.	4-4 1/2 x 6	GorK	3
Dakota, 15-27	1750	3	Dom.	4-4 1/2 x 6	Gas.	3	Mohawk, 1921	8-16	785	2	Light	4-3 1/2 x 4 1/2	KorG	1-2	Universal, 501	1-4	475	2	Own	1-3 1/2 x 5	G	1		
Dart, B.J.	15-30	2100	4	Buda	4-4 1/2 x 6	Gas.	3-4	Moline Univ D	9-18	990	2	Own	4-3 1/2 x 5	Gas.	2-3	Utiliter, 501	2 1/2	380	4	Own	1-3 1/2 x 4 1/2	G	5-6	
Deque, A	20-30	2500	4	Buda	4-4 1/2 x 6	Gas.	3	Moline Orch	9-18	1075	2	Own	1-2 1/2 x 4 1/2	Gas.	3-4	Valie, Biltwell	12-24	1750	4	Own	4-4 1/2 x 5 1/2	G.K.D	3	
Dill, D	20	2180	4	Cont.	4-4 1/2 x 6 1/2	Gas.	3	Motor Mault.	1 1/2	195	2	Own	1-2 1/2 x 4 1/2	Gas.	3-4	Victory, 1921	9-18	1350	4	Gray.	4-5 1/2 x 7	G.D	6	
Dix, R.W.	20	2980	4	Mid. W	4-4 1/2 x 6	Gas.	3	Motex	15-30	2250	4	Buda	4-4 1/2 x 6	Gas.	3-4	Victory, 1921	15-30	1750	4	Wauk	4-4 1/2 x 5 1/2	Gas.	3	
Dix-It-All, -7	595	.....	.....	Own	1-4 1/2 x 5	Gas.	.....									Vim, B	15-30	1650	4	Wauk	4-4 1/2 x 5 1/2	G.K	3	
Eagle, F	12-22	1390	4	Own	2-7 x 8	GorK	3-4	NB, 1	3-6	425	4	Own	2-3 1/2 x 4	Gas.	3	Wallis, K	15-25	1600	4	Own	4-4 1/2 x 5 1/2	G.K	3	
Eagle, F	16-30	1850	4	Own	2-8 x 8	GorK	4-5	NB, 2	3-6	425	4	Own	2-3 1/2 x 4	Gas.	3	Waterloo, N	12-25	1450	4	Own	2-6 1/2 x 7	G.K	3	
E.B., AA	12-20	1445	4	Own	4-4 1/2 x 5	GorK	3	Nichols-Shep.	20-42	3100	4	Own	8 x 10	GorK	3-6	Weebot, 53	28-53	5000	*2	Wise.	4-5 1/2 x 7	G.D	6	
E.B., Q	12-20	925	4	Own	4-4 1/2 x 5	GorK	3	Nichols-Shep.	20-42	3100	4	Own	8 x 10	GorK	3-6	Wellington, B	12-22	900	4	Erd.	4-4 x 6	Ker.	2-3	
E.B., 16-32	2000	4	Own	4-5 1/2 x 7	GorK	4	Nichols-Shep.	25-50	3460	4	Own	9 x 12	GorK	4-7	Wellington, F	16-30	1400	4	Chief	4-4 1/2 x 6	Ker.	3-4		
Evans, 18-30	2000	4	Buda	4-4 1/2 x 6	G.K	3	Nichols-Shep.	25-50	3460	4	Own	9 x 12	GorK	4-7	Western, 1920	16-32	2100	4	Clim.	4-5 1/2 x 6	Gas.	4		
Fageol, D	9-12	1525	4	Lyc.	4-3 1/2 x 5	Gas.	2	Nilson Jr., E	15-25	1775	4	Wauk	4-4 1/2 x 5 1/2	GorK	3	Westmore, 1920	12-25	16						

# COMING MOTOR EVENTS

## AUTOMOBILE SHOWS

Milwaukee	State Fair Automobile Show	Aug. 29-Sept. 3
Kewanee, Ill.	Automobile Races, County Fair	Sept. 5 and 10
Byberry, Pa.	Phila. County Fair and Tractor Show	Sept. 5-10
Indianapolis	Automobile and Accessory Show	Sept. 6-10
Ottawa, Ont.	Automobile Show	Sept. 9 to 17
Waterloo	Automobile Show	Sept. 26-Oct. 2
New York	Electrical Exposition	Sept. 28-Oct. 8
Cincinnati	Fall Automobile Show	Oct. 1-8
Omaha	International Automobile Congress	Nov. 3-5
Olympia, England	Automobile Show	Nov. 3-12
Chicago	Automotive Equipment Show	Nov. 14-19
New York	Automobile Salon	Nov. 27-Dec. 3
Chicago	Automobile Salon	January, 1922
New York	National Automobile Show	Jan. 7-13, 1922
Chicago	National Automobile Show	Jan. 28-Feb. 3, 1922
Minneapolis	Tractor Show	Jan. 30 to Feb. 4, inclusive
Winnipeg, Canada	Canadian Automotive Equipment Ass'n Show	Feb. 6-11
Louisville, Ky.	Louisville Automobile Show	Feb. 20-25

## RACES

Pikes Peak	Hill Climb	Sept. 5
Uniontown Speedway	Annual Autumn Classic	Sept. 5
Byberry, Pa.	Phila. County Fair	Sept. 10
Los Angeles	Speedway Race	Nov. 24

## FOREIGN SHOWS

Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Constantinople	Traction Trials	Sept. 5
Berlin	Automobile Show	Sept. 23-Oct. 2
Paris, France	Paris Motor Show	Oct. 5-16
London	British Motor Show, Society Motor Mfgs. and Traders	Nov. 4-11
Santiago, Cuba	Annual Automobile Show	March, 1922
Rio de Janeiro, Brazil	Automotive Exhibition	September, 1922

## CONVENTIONS

Detroit	Credit Convention Motor and Accessory Manufacturers' Ass'n	Sept. 14-16
Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-14
Cleveland	National Tire Dealers' Association	November
Chicago	Chicago Semi-Annual Convention of Factory Service Managers N. A. C. C.	Nov. 22-24
New York	Service Managers Convention	Nov. 22-24

## Canadian Garage Men Plan Dominion-wide Association

Saskatoon, Sask., Aug. 26—For the promotion of the interests of garagemen generally, an organization known as the Saskatchewan Garage Men's Assn., with headquarters here, is being formed with the ultimate object of making it a Dominion-wide association. The organization, it is pointed out, is not being promoted for the advantage of the members against the public. The plan is to so establish the business of automobile and car repairs that the benefits which accrue to members of the association will also result in great advantage to customers.

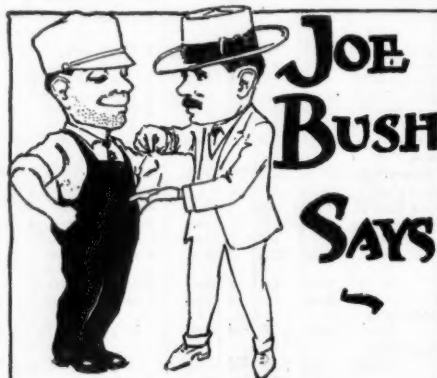
It is proposed that for the present each garageman in the province, and later on in the Dominion, shall be a member, but other men connected with garages such as employees or others who wish to join, will be permitted to do so.

## FIRESTONE AT 1920 PEAK

Akron, Aug. 29—That which it has been freely predicted would never happen, namely, any of the major tire building companies of America returning to their 1920 records of peak production this

year, has been accomplished by the Firestone Tire & Rubber Co., of Akron.

Firestone has been adding men and steadily increasing production, and this week has climbed back to an average



IT might be a good thing if every car designer would spend a few months in the repairshops with us boys.

production of over 28,500 tires daily, which compares with the company's 1920 peak established a year ago last April of 28,800 tires a day. The present Firestone record is 28,500 casings and 30,000 tubes daily.

A significant point is the fact that Firestone has returned to its peak production with slightly more than 50 per cent of its peak number of employees, and despite the fact that its factories are now operating on a basis of fewer hours of factory work a week. When Firestone reached the mark of 28,800 tires in April, 1920, it was running every department 24 hours a day and six days a week.

Today Firestone is making the same production with a little more than half as many employees, and is running most of its departments only 18 hours a day, on a six-day weekly basis. Most departments are operating two nine-hour shifts, and only a few are running three eight-hour shifts daily.

## Portland Fordson Dealers' Demonstration Is Success

Portland, Ore., Aug. 27—One of the largest tractor demonstrations ever held in this country by one organization came to a close last week, after two weeks of successful display, under the auspices of the Fordson dealers throughout Oregon and the nine southern counties of Washington.

The demonstration was held on a farm about 10 miles east of Portland. Twenty Fordson tractors were in use constantly and every imaginable kind of farm machinery to which one of the tractors could be hitched was demonstrated. Automobiles were plying constantly between Portland and the demonstration point and throughout the two weeks thousands of persons from Portland and from other points throughout Oregon and southern Washington were in attendance.

At the demonstration farm it was arranged to give demonstrations of threshing grain, baling straw, breaking land, plowing, harrowing and seeding. A piece of timber land adjoining was cleared by means of a Fordson outfit and the land broken into shape for farming. Demonstrations of road building were also made and all kinds of belt work were performed by the Fordsons, including grinding feed and filling silos.

Over 60 Fordson dealers throughout this territory aided in the demonstration and most of these were on hand throughout the two weeks to aid in making the big event successful. The demonstration was under the immediate charge of the combined Fordson dealers of Portland.

## HOOSIER SHOW BIGGEST EVER

Indianapolis, Aug. 26—John B. Orman, manager of the Indianapolis Automobile Trade Assn.'s twenty-third semi-annual show, which will be held in conjunction with the state fair, Sept. 5 to 10, announces that the number of exhibitors this year is in excess of last year and that the space to be occupied is greater than ever before. The exhibition this year will be kept open at night without admittance fee.